U.S. DEPARTMENT OF THE INTERIOR

OFFICE OF WATER RESOURCES RESEARCH
WATER RESOURCES SCIENTIFIC INFORMATION CENTER

SELECTED WATER RESOURCES ABSTRACTS

LIBRARY
FEB 1 1972
PACIFIC POWER & LIGHT COMPANY

VOLUME 5, NUMBER 1
JANUARY 1, 1972

W72-00001 -- W72-00570

SELECTED WATER RESOURCES ABSTRACTS is published semimonthly for the Water Resources Scientific Information Center (WRSIC) by the National Technical Information Service (NTIS), U.S. Department of Commerce. NTIS was established September 2, 1970, as a new primary operating unit under the Assistant Secretary of Commerce for Science and Technology to improve public access to the many products and services of the Department. Information services for Federal scientific and technical report literature previously provided by the Clearinghouse for Federal Scientific and Technical Information are now provided by NTIS.

SELECTED WATER RESOURCES ABSTRACTS is available to Federal agencies, contractors, or grantees in water resources upon request to: Manager, Water Resources Scientific Information Center, Office of Water Resources Research, U.S. Department of the Interior, Washington, D. C. 20240.

SELECTED WATER RESOURCES ABSTRACTS is also available on subscription from the National Technical Information Service. Annual subscription is $22 (domestic), $27.50 (foreign), single copy price $3. Certain documents abstracted in this journal can be purchased from the NTIS at prices indicated in the entry. Prepayment is required.

SELECTED
WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Resources Research, U.S. Department of the Interior

VOLUME 5, NUMBER 1
JANUARY 1, 1972

W72-00001 -- W72-00570

Use of funds for printing this publication approved by the Director of the Bureau of the Budget, September 4, 1968.

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.

LIBRARY
FEB 1 1972
PACIFIC POWER & LIGHT COMPANY

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Resources Research
U.S. Department of the Interior
Washington, D. C. 20240

CONTENTS

FOREWORD---iii

SUBJECT FIELDS AND GROUPS

(Use Edge Index on back cover to Locate Subject Fields and Indexes in the journal.)

01 NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL
Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Non-Water Activities; Watershed Protection.

05 WATER QUALITY MANAGEMENT AND PROTECTION
Includes the following Groups: Identification of Pollutants; Sources of Pollution; Effects of Pollution; Waste Treatment Processes; Ultimate Disposal of Wastes; Water Treatment and Quality Alteration; Water Quality Control.

06 WATER RESOURCES PLANNING
Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development.

07 RESOURCES DATA
Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication.

08 ENGINEERING WORKS
Includes the following Groups: Structures; Hydraulics; Hydraulic Machinery; Soil Mechanics; Rock Mechanics and Geology; Concrete; Materials; Rapid Excavation; Fisheries Engineering.

09 MANPOWER, GRANTS, AND FACILITIES
Includes the following Groups: Education—Extramural; Education—In-House; Research Facilities; Grants, Contracts, and Research Act Allotments.

10 SCIENTIFIC AND TECHNICAL INFORMATION
Includes the following Groups: Acquisition and Processing; Reference and Retrieval; Secondary Publication and Distribution; Specialized Information Center Services; Translations; Preparation of Reviews.

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

01. NATURE OF WATER

1A. Properties

LIGHT SCATTERING AND ULTRASONIC INVESTIGATIONS OF RELAXATION IN AQUEOUS SOLUTIONS,
Catholic Univ., of America, Washington, D.C.
T. A. Litovitz.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $0.70. Office of Saline Water Research and Development Progress Report No 402, Dec 1968. 73 p, 6 fig, 5 tab, 44 ref. OSW Grant No 14-01-0001-608.

Descriptors: *Aqueous solutions, *Physicochemical properties, *Solvation, Solutes, Water structure, Electrolytes, Water properties, *Ultrasonic, Sound waves.
Identifiers: *Relaxation phenomena, *Ultrasonic absorption.

Sound velocity and absorption measurements were made in a number of aqueous electrolytic solutions, principally the 2-2 valent sulfates. Ultrasonic pulse measurements were used in the frequency region from 30 to 900 MHZ and the technique of Brillouin Light scattering was employed in a number of measurements between 600 MHZ and 7000 MHZ. (McCoy-Office of Saline Water)
W72-00378

1B. Aqueous Solutions and Suspensions

WATER STRUCTURE AS A DETERMINANT OF ION DISTRIBUTION IN LIVING TISSUE,
Auckland Univ. (New Zealand). Dept. of Medicine.
P. M. Wiggins.
Journal of Theoretical Biology, Vol 32, No 7, p 131-146, July 1971. 3 tab, 3 fig, 46 ref.

Descriptors: *Water structure, *Molecular structure, *Hydration, *Water chemistry, *Ions, Anions, Potassium, Sodium, Hydrates, Water properties, Kinetics, Thermodynamic behavior, Biological membranes, Biological properties, Physicochemical properties, Ion exchange, Ion transport, Absorption, *Cytological studies, *Anion absorption, *Cation absorption.

Evidence has accumulated that cell water is significantly more ordered than is water in a simple electrodyte solution and that both kinetic and thermodynamic properties of water are perturbed for some distance out from the interface between a liquid and a polar solid. Apparently, all ions perturb the structure of water. When a kinetic property, the viscosity B-coefficient, is plotted against a thermodynamic property, the free energy of hydration of a single ion, the biologically important ions can be divided into 2 classes having opposite effects. Na, Ca and Mg ions were net water structure-orderers, while the anions and K ion were net water structure-disorderers. Other properties of aqueous solutions confirm these 2 classes existence, and that the dividing line is between Na and K. It is proposed that the cell matrix orders water inside a cell, and, due to diminishing solubility with ordering power, ions are increasingly excluded from a cell as their ordering powers increase. This is supported by data on ion distributions in frog muscle cells and by examples in non-biological systems. Using thermodynamic considerations, it is shown that the structural nature of cell water could be solely responsible for the observed distribution of ions in living tissue. (Casey-Arizona)
W72-00207

LIGHT SCATTERING AND ULTRASONIC INVESTIGATIONS OF RELAXATION IN AQUEOUS SOLUTIONS,
Catholic Univ., of America, Washington, D.C.
For primary bibliographic entry see Field 01A.
W72-00378

02. WATER CYCLE

2A. General

THE FRESHWATER-SUPPLY PROBLEMS OF MANKIND,
Moscow State Univ. (USSR); and Akademiya Nauk SSSR, Moscow. Inst. of Water Research; and Akademiya Nauk SSSR, Moscow. Geologicheskii Institut; and Gosudarstvennyi Gidrologicheskii Institut, Moscow (USSR).
B. I. Kudelin, V. N. Kunin, M. I. L'vovich, and A. A. Sokolov.
Soviet Geography: Review and Translation, Vol 12, No 6, p 336-346, June 1971. 3 fig, 5 tab.

Descriptors: *Water balance, *Water resources, *Water supplies, *Waste water (Pollution), *Runoff, Arid lands, Subsurface flow, Mapping, Hydrologic cycle, Water conservation, Water reuse, Irrigation practices, Soil moisture, Water sources.

The total volume of the hydrosphere amounts to 1.5 billion cu km of water, of which only 0.3%, or 4 million cu km is accessible freshwater. In view of the fact that all water sources are closely interconnected, it is stressed that evaluations of water resources should be quantitative and based on the water balance principle. Water balance equations are developed and graphs are presented illustrating relationships between balance elements. The regulation of the runoff and the water balance of an area is one way of achieving an expanded renewal of water resources, and several practical methods are reviewed. Although runoff reserves can be regarded as still ample, substantial regions of the world (parts of Europe, the U.S. and the USSR) are already showing clear evidence of depletion of water resources. The cause lies in waste waters, produced mainly as a result of water-supply uses. The solution to this problem emphatically does not lie in the development of new freshwater sources but rather through treatment and recycling of fresh waters thereby curbing their discharge into natural bodies of water. Although it might be possible to turn all surface waters into open waste disposal sewers, such a course would destroy many of the natural processes dependent upon water. Only by realizing that water is not just an economic rescorce, will we be able to form a proper picture of the true value of water resources. (Casey-Arizona)
W72-00187

STOCHASTIC DIFFERENCE EQUATION MODELLING OF HYDROLOGIC PROCESSES,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
R. A. Rao, and R. L. Kashyap.
Paper presented at International Symposium on Mathematical Models in Hydrology, Warsaw, Poland, July 26-31, 1971. 4 fig, 4 tab, 11 ref. NSF Grant GR18225 AFOSR Grant 19-1776. OWRR B-025-IND (1).

Descriptors: *Rainfall-runoff relationships, *Model studies, *Systems analysis, *Mathematical studies, *Hydraulic models, Equations, Computer programs, Stochastic processes.

Hydrologic processes are modelled in the form of finite difference equations. The problem of parameter estimation by the method of moments, especially for systems of higher order, can be formidable both from the computational and analytical points of view. In order to overcome this problem a recursive system identification procedure, along with a prediction scheme, was proposed. The identification of the system parameters and the single step or multistep prediction of the variable of interest are performed simultaneously. Three aspects of hydrologic interest are discussed by using the algorithm. These are the prediction of daily flows, the modelling of the systems of different orders for simulating daily flows, and an analysis of the criterion to select the 'best' system model. The performances of systems of various orders are analyzed by using their error characteristics. The method of analysis is illustrated by using data from two rivers in Indiana. (Woodard-USGS)
W72-00306

CHARACTERISTICS AND FILTERING OF NOISE IN LINEAR HYDROLOGIC SYSTEMS,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
J. W. Delleur, and R. A. Rao.
Paper presented at International Symposium on Mathematical Models in Hydrology, Warsaw, Poland, July 26-31, 1971. 5 fig, 15 ref. OWRR B-008-IND (4) OWRR B-002-IND.

Descriptors: *Rainfall-runoff relationships, *Mathematical models, *Systems analysis, *Input-output analysis, Computer programs, Hydraulic systems, Computers.
Identifiers: *Noise filtering (Systems analysis).

The identification and fitting of a linear model of the short-range rainfall-runoff transformation are affected by the presence of noise generated by the computational procedure and by errors in the data. The digitization and computational noise was analyzed by means of the Fourier amplitude spectra of the input and of the output. The effect of this noise may be reduced by judicious choice of the digitization step and of the truncation limits of the integrations in the transform domain. The rainfall data are usually more contaminated by noise due to error than the runoff data. The noise attributed to the rainfall data is estimated and its probability distribution and spectrum are then obtained. The error noise may be controlled by digital filtering. The effectiveness of the filters is shown by comparing the rainfall noise spectra obtained from filtered and unfiltered data. (Woodard-USGS)
W72-00310

LINEAR SYSTEMS ANALYSIS IN HYDROLOGY--THE TRANSFORM APPROACH, THE KERNEL OSCILLATIONS AND THE EFFECT OF NOISE,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
J. W. Delleur, and R. A. Rao.
Paper presented at United States-Japan Bi-Lateral Seminar in Hydrology, Honolulu, January 1971. 21 p, 8 fig, 9 ref. OWRR B-008-IND (3) and B-022-IND ( ).

Descriptors: *Rainfall-runoff relationships, *Surface runoff, *Model studies, *Systems analysis, *Input-output analysis, Infiltration, Evaporation, Water balance, Hydrologic budget, Hydrographs, Mathematical studies, Hydrologic data.

The Fourier, Laplace and Z-transforms were used to evaluate the impulsive response of watersheds from discrete rainfall excess and direct runoff values. Runoffs for arbitrary storms could then be obtained making use of the convolution integral. The methods were compared for their accuracy, stability, and computing time by using a theoretical example. The computed kernel functions (impulsive responses) for a number of storms showed large oscillations. These could be due to noise, primarily in the input data and also in the output data. Several digital filters were tested to filter the input, or the output, or both, or to filter the calculated kernel functions. (Woodard-USGS)
W72-00317

ANALYSIS OF THE INTERACTION OF RIVER AND SUBSURFACE WATERS (NEKOTORYYE ELEMENTY ANALIZA VZAIMODEYSTVIYA RECHNYKH i PODZEMNYKH VOD),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02F.

W72-00320

ROLE OF ARTESIAN WATER IN THE FORMATION OF STREAMFLOW AS ILLUSTRATED BY THE TOSNA RIVER (OTSENKA ROLI NAPORNYKH PODZEMNYKH VOD V FORMIROVANII RECHNOGO STOKA NA PRIMERE R. TOSNY),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02F.
W72-00321

EFFECT OF INTENSIVE GROUNDWATER USE ON STREAMFLOW (OB ISSLEDOVANII VLIYANIYA INTENSIVNOY EKSPLUATATSII PODZEMNYKH VOD NA STOK REK),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02F.
W72-00325

SURFACE AND SUBSURFACE FLOW INTO RIVERS OF THE WEST SIBERIAN PLAIN (POVERKHNOSTNYY I PODZEMNYY PRITOK V REKI ZAPADNO-SIBIRSKOY RAVNINY),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02F.
W72-00326

2B. Precipitation

EXPERIMENTAL HYDROLOGIC INVESTIGATIONS AT VALDAY (EKSPERIMENTAL'NYYE GIDROLOGICHESKIYE ISSLEDOVANIYA NA VALDAYE).
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).

Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 181, Kuznetsov, V.I., ed, 1970. 196 p.

Descriptors: *Evaporation, *Precipitation (Atmospheric), *Discharge (Water), Waste water (Pollution), Industrial wastes, Bottom sediments, Water storage, Melt water, Soil water, Runoff, Percolation, Moisture content, Water temperature, Wind velocity, Forests, Dunes, Snow cover, Brines, Evaporation pans, Precipitation gages.
Identifiers: *USSR, Valday Hills, Polomet' River, Evaporimeters, Radiometers, Telethermometers, Thermistors, Forest litter, Spruce, Mineralization.

This collection of 13 papers is devoted to a study of procedures for measuring atmospheric precipitation and for calculating evaporation from water surfaces, industrial wastes, brine solutions, and from snow under a forest canopy. Methods for computing sand dune dimensions, bottom sediment discharge, wind velocity, and maximum discharges and percolation of melt water are examined along with water storage data for forest litter and data on the radiation balance in a spruce forest. The concluding two papers discuss the tentative applications of a radiometer for determining the mean temperature of an underlying surface and of a telethermometer for measuring the temperature of the water surface. (See also W72-00062 thru W72-00070) (Josefson-USGS)
W72-00061

EFFECT OF PRECIPITATION AND EVAPORATION ON CHANGES IN SOLUTION CONCENTRATION (VLIYANIYE DOZHDEY I ISPARENIYA NA IZMENENIYE KONTSENTRATSII RASTVOROV),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 05B.
W72-00064

ESTIMATION OF INTERCEPTED SOLID PRECIPITATION AND DETERMINATION OF EVAPORATION FROM A SPRUCE FOREST DURING A WINTER PERIOD (OTSENKA VELICHINY ZADERZHANIYA TVERDYKH OSADKOV I OPREDELENIYE ISPARENIYA S YELOVOGO LESA V ZIMNIY PERIOD),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
S. F. Fedorov, and A. S. Burov.
In: Eksperimental'nyye gidrologicheskiye issledovaniya na Valdaye; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 181, p 77-86, 1970. 6 tab, 15 ref.

Descriptors: *Precipitation (Atmospheric), *Snow, *Evaporation, *Forests, Deciduous trees, Coniferous trees, Seasonal, Water storage, Transpiration, Wind velocity, Snow surveys, Precipitation gages, Evaporation pans.
Identifiers: *USSR, Valday Hills, Polomet' River, Malaya Nisha River, Kholova River, Mayata River, Lake Ilmen, Spruce, Forest canopy, Tree crowns.

Special on-site investigations were conducted by the Valday Hydrologic Scientific Research Laboratory in 1965-69 in basins of the Polomet' (Valday Hills) Malaya Nisha, Kholova, and Mayata River (Lake Ilmen Lowland) to measure solid precipitation and snow storage in a deciduous forest and on deciduous and coniferous forest clearings of various size. The amount of solid precipitation on a forest clearing in deciduous timber was approximately 18% higher than that in the deciduous forest. Snow storage on a clearing in a coniferous forest differed little from that in a deciduous forest, with the average difference being only 8%. Calculated values of the precipitation intercepted by spruce crowns for 4 winter periods were based on Tret'yakov precipitation gage measurements in deciduous and coniferous forests and varied between 24 and 35 mm. Total evaporation from a forest was defined as the sum of evaporation from the solid precipitation intercepted by treetops and evaporation from the snow under a forest canopy. Assuming a value of about 8 mm as the average amount of evaporation from snow under a forest canopy for December-March and a value of 29 mm as the amount of evaporation from snow intercepted by treetops, the average total evaporation from a spruce forest for the period was about 37 mm. Evaporation from a spruce forest in the Valday region during the winter months examined was approximately 30% greater than that from woodless areas. (See also W72-00061) (Josefson-USGS)
W72-00065

ACCURATE MEASUREMENT OF ATMOSPHERIC PRECIPITATION BY THE TRET'YAKOV PRECIPITATION GAGE (O KORREKTNOM IZMERENII ATMOSFERNYKH OSADKOV OSADKOMEROM TRET'YAKOVA),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
V. S. Golubev.
In: Eksperimental'nyye gidrologicheskiye issledovaniya na Valdaye; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 181, p 87-97, 1970. 1 fig, 5 tab, 8 ref.

Descriptors: *Precipitation (Atmospheric), *Precipitation gages, *Rain gages, Wind velocity, Shrubs, Seasonal, Snow cover, Water storage, Wetting, Evaporation.
Identifiers: *USSR, Tret'yakov precipitation gages.

Observation data on Tret'yakov precipitation gages installed under various sheltering conditions were compared with observations made under standard conditions to establish reliable methods of measuring precipitation. Atmospheric precipitation may be collected in the Tret'yakov gage without shortage of precipitation catch due to wind action, provided the collecting surface of the gage is flush with the adjacent surface. Solid, liquid and mixed precipitation, adjusted for the effects of wind velocity, may be measured by the Tret'yakov gage installed at the level of the surface of shrubs sheared at a height of 2 m. The same results may be obtained by installing the gage on a small clearing in a dense 2- to 6-mm high overgrowth or in a shielded enclosure in a sparsely-wooded area. A double-shielded enclosure, designed and tested by the Valday Hydrologic Scientific Research Laboratory, was used to calculate precipitation in an open area. Application of the gravimetric method of measurement and the use of transformer oil and a calcium chloride antifreeze solution preclude the need of correcting for wetting and evaporation. These recommendations are applicable to conditions where (1) the average daily wind velocities at a height of 2 m in an open area do not exceed 10 m/sec; (2) the maximum height of snow cover is 80 cm; and (3) the minimum air temperature does not drop below minus 36 deg C. (See also W72-00061) (Josefson-USGS)
W72-00066

INFILTRATION, THROUGHFLOW, AND OVERLAND FLOW,
Bristol Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 02G.
W72-00105

CLIMATIC GEOMORPHOLOGY,
Cambridge Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 02E.
W72-00113

GEOMORPHIC IMPLICATIONS OF CLIMATIC CHANGES,
Colorado State Univ., Fort Collins. Dept. of Geology.
For primary bibliographic entry see Field 02E.
W72-00114

SUMMER RAINFALL OVER THE SANTA CATALINA MOUNTAINS,
Arizona Univ., Tucson. Inst. of Atmospheric Physics.
L. J. Battan, and C. R. Green.
University of Arizona Institute of Atmospheric Physics Technical Report No. 22, 11 p, 15 June 1971. 8 fig, 1 ref.

Descriptors: *Arizona, *Elevation, *Rainfall, *Distribution patterns, *Mountains, Arid lands, Summer, Rain gages, Mapping, Variability, Time, Time lag, Nocturnal, Diurnal.

During the summers of 1957-1960, the Institute of Atmospheric Physics operated a network of 29 recording rain gages distributed over the Santa Catalina Mountains. A new network of 35 gages was operated during the summers of 1961, 1962 and 1964. The average summer rainfall was from showers and thunderstorms of a local nature. This report summarizes some of its features. There was a pronounced relationship between rainfall amount and station altitude. The rainfall above 8,000 ft elevation was about 0.18 in/day which was about twice as large as that in the surrounding lowlands below 4,000 ft. When broken down into daytime and nighttime rainfall, the latter was less and the maxima were shifted towards lower elevations. The variance of daily rainfall increased with altitude also, but by a smaller amount than the increase in mean rainfall. As a function of time, there is a distinct minimum in the early morning hours and a pronounced maximum during the late afternoon and evening. Rainfall at lower elevations lagged some two to three hours behind that at higher elevations. (Casey-Arizona)
W72-00168

POSSIBLE EFFECTS OF HUMAN ACTIVITY ON WORLD CLIMATE,
British Meteorological Office, Bracknell (England).
For primary bibliographic entry see Field 05C.
W72-00171

DEVELOPMENT OF A STABILITY CORRECTION FOR ESTIMATING CONVECTIVE TRANSFER,
Oregon State Univ., Corvallis. Dept. of Forest Engineering.
H. R. Holbo.
Oregon State University Technical Report 71-7, June 8, 1971. 10 p, 2 fig, 13 ref. OWRR A-999-ORE (9).

Descriptors: *Water vapor, *Heat transfer, *Convection, *Atmosphere, *Mathematical studies, Equations, Turbulence, Energy budget, Evaporation.
Identifiers: *Convective transfer, Stability correction, Richardson number.

The vertical transport of heat or vapor from the earth's surface by atmospheric turbulence is significantly influenced by the degree of temperature stratification. Surface layer flux estimation methods, which utilize mean profiles of micrometeorological variables, must consequently be corrected, since the wind structure alone is an incomplete characterization of the magnitude of convective transfer. Energy budget theory is applied to develop a correction term for this purpose based on the Richardson number. The F (Ri) value is plotted as a function of the Richardson number on the abscissa. Mean profiles of windspeed, potential temperature and vapor pressure were obtained for three clear summer days over a large, flat, unvegetated pumice deposit in Central Oregon. Observations were taken at 5-minute intervals from which hourly means were computed. Measurements were 20, 40, 80, 160, 240 and 320 cm above the surface. Net radiation, Q, was measured and the soil heat flux, G, was computed using soil temperature measurements. Log plots of windspeed, temperature and vapor pressure were examined and two levels chosen for computation of H' (A), E' (A), and Ri. Fifty-two hourly determinations were made. For these Ri ranged between -0.01 and -10. The best-fit line for these data yields the required correction term: F& (1 .. 34 Ri) 0.55. (Woodard-USGS)
W72-00316

ESTIMATION OF GROUNDWATER RECHARGE BY ATMOSPHERIC PRECIPITATION WITH FEW OR NO OBSERVATIONS OF THE GROUNDWATER REGIME (METOD OTSENKI PITANIYA GRUNTOVYKH VOD ATMOSFERNYMI OSADKAMI PRI NEDOSTATOCHNOSTI ILI OTSUTSTVII NABLYUDENIY ZA REZHIMOM GRUNTOVYKH VOD),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02F.
W72-00324

2C. Snow, Ice, and Frost

INVENTORY OF GLACIERS IN THE NORTH CASCADES, WASHINGTON,
Geological Survey, Washington, D. C.
For primary bibliographic entry see Field 07C.
W72-00060

ESTIMATION OF INTERCEPTED SOLID PRECIPITATION AND DETERMINATION OF EVAPORATION FROM A SPRUCE FOREST DURING A WINTER PERIOD (OTSENKA VELICHINY ZADERZHANIYA TVERDYKH OSADKOV I OPREDELENIYE ISPARENIYA S YELOVOGO LESA V ZIMNIY PERIOD),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02B.
W72-00065

THE DYNAMICS OF TEMPERATURE GLACIERS FROM THE DETAILED VIEWPOINT,
Centre National de la Recherche Scientifique, Grenoble (France). Laboratoire de Glaciologie.
L. Lliboutry.
Journal of Glaciology, Vol 8 No 53, p 185-205, June 1969. 9 fig, 5 tab, 16 ref, append.

Descriptors: *Rheology, *Glaciers, *Movement, *Strain, Creep, Ice, Cryology, Deformation, Stress, Melting, Regimen, Water balance, Plasticity, Viscosity, Mechanical properties.
Identifiers: *Glacier dynamics.

The stresses and strains in a limited region of a temperature glacier are approximated by polynomials. Glen's law can be replaced by a more convenient law. Initially, a plane problem with a flat glacier surface is considered. The theoretical possibility of very important deviations from the classical relations is demonstrated. The calculation is then extended to the more general case in which the surface of the glacier is no longer a plane and the width also varies. Starting from a precise survey of the surface and measurements of surface velocity, velocities and stresses can be calculated at depth, and the bedrock profile can be extrapolated into regions inaccessible by seismic sounding. A provisional calculation was made for the ice fall between the Glacier du Geant and the Glacier du Tacul (Mont-Blanc massif). The law of friction can be determined experimentally; proceeding down-glacier, the sliding velocity decreases from about 830 m/year to about 250 m/year, while the normal pressure increases from about 2.8 to about 18.5 bar. At the same time the friction increases from about 1.1 to about 4.3 bar, approximately proportional to the pressure. (Knapp-USG)
W72-00087

PRESSURES INSIDE FREEZING WATER DROPS,
Council for Scientific and Industrial Research, Pretoria (South Africa). National Physical Research Lab.
P. J. Visagie.
Journal of Glaciology, Vol 8, No 53, p 301-309, June 1969. 6 fig, 3 ref.

Descriptors: *Freezing, *Ice, *Pressure, Temperature, Water pressure, Crystal growth, Water temperature, Pressure measuring instruments, Piezometers, Cryology, Cloud physics, Instrumentation.
Identifiers: Freezing pressure (Ice).

A small quartz Bourdon tube was employed to measure the pressures that develop inside 7 and 10 mm diameter water drops freezing in stirred cold liquid baths. In general, the pressure repeatedly rose and then was relieved by cracks in the ice shell as freezing proceeded. The cracking pressure tended to increase with the shell thickness and was dependent on the freezing rate. Pressures up to 76 bar were observed. The effect of the concentration of dissolved gas was investigated. Empirical relationships were found relating cracking pressure to the internal radius of an ice shell and to the average temperature gradient across its thickness. (Knapp-USGS)
W72-00088

SPRING BREAKUP OF THE DELTA RIVER, ALASKA,
Cold Regions Research and Engineering Lab., Hanover, N.H.
C. W. Slaughter, and H. R. Samide.
Available from NTIS, Springfield, Va 22151 as AD-724 683-$3.00 paper copy; $0.95 microfiche. Cold Regions Research and Engineering Laboratory Special Report 155, April 1971. 33 p, 1 fig, 3 tab, 12 ref, append.

Descriptors: *Ice breakup, *Rivers, *Braiding, *Alaska, Monitoring, Glaciers, Air temperature, Open channel flow, Arctic, Ice jams, Ice-water interfaces, Snow, Permafrost, Flood plains, Streamflow.
Identifiers: *Delta River (Alaska), Spring ice breakup.

Monitoring of the spring breakup of snow and ice on the Delta River, Alaska, in 1967 indicates that the breakup is a relatively calm event. The river is a braided stream and gradual development of open-water channels takes place from headwaters to mouth. Air temperature data at Big Delta, near the river mouth, shows an accumulation of 30 positive degree-days (deg F) above 32 deg F, using mean daily values, prior to first observation of continuous open water; a corresponding value, using maximum daily air temperatures, was 224 degree days. A photographic sequence of breakup at several places is included. Delta River flows from the Tangle Lakes area of the Alaska Range northward to join Tanana River at Big Delta. About 255 sq mi of the 1665 sq-mi area of the basin area are covered by glaciers. Data analysis indicates that widely braided rivers such as the Delta are not subject to massive ice jams and sudden water rises, such as described for the Yukon and other rivers. (Land-USGS)
W72-00094

THE GEOMORPHOLOGY AND MORPHOMETRY OF GLACIAL AND NIVAL AREAS,
Durham Univ. (England). Dept. of Geography.
I. S. Evans.
In: Introduction to Fluvial Processes, Methuen, London, p 157-168, 1971. 3 fig, 24 ref.

Descriptors: *Glaciation, *Land forming, *Scour, *Geomorphology, Erosion, Sedimentation, Sediment transport, Abrasion, Cirques, Snowmelt, Hydrogeology, Glaciers, Glacial drift.
Identifiers: Glacial morphometry, Fluvial processes, Glacial erosion.

Glacial and nival hydrology is particularly sensitive to temperature and radiation, and hence latitude, altitude, and aspect are especially important influences on glacial and nival landforms. Slope gradient and aspect affect the surface receipt of precipitation and radiation. This leads to asymmetry of nival balance (affecting intensity of glaciation) and of temperature (affecting freeze-thaw cycles, chemical weathering, and availability of meltwater). The greatest direct radiation at a given angle of latitude is received by an equatorial-facing slope of similar angle, and the least by steep north-facing slopes. This effect is most marked in middle latitudes and in clear conditions. The influence of aspect is greatest in areas of 'marginal glaciation', where the regional snowline is not far below mountain crests. Erosion by valley glaciers depends upon rock erodibility, the amount of basal debris, the 'hydraulic geometry' of the glacier channel, and basal ice conditions, such as velocity, viscosity, and temperature. Landforms related to past glaciation suggest that erosion increased where glaciers became either thicker or faster. Fast-flowing glaciers can achieve considerable abrasion, especially if they slide over their bed; however, it is plucking which seems to account for most glacial erosion. This is greatly facilitated if glacier ice freezes to a loosened block. (See also W72-00100) (Woodard-USGS)
W72-00110

PERIGLACIAL MORPHOMETRY,
Cambridge Univ. (England). Dept. of Geography.
B. A. Kennedy.
In: Introduction to Fluvial Processes, Methuen, London, p 169-176, 1971. 4 fig, 11 ref.

Descriptors: *Permafrost, *Frozen ground, *Land forming, *Geomorphology, Erosion, Sediment transport, Scour, Soil water movement, Ice, Abrasion, Slopes, Valleys.
Identifiers: *Fluvial processes, *Periglacial morphology.

In this report the discussion of periglacial landforms is limited to those features which are uniquely present in regions of frozen ground. The landforms of periglacial areas tend to resemble those of the other major fluvial regions of the earth's surface, both in their complexity and types. Considering the vast extent of permafrost, and the range of climatic regimes, lithology, and relief to be found in such areas, the diversity of landforms is not surprising. Where sections of permafrost underlain by thick layers of ice are exposed to direct lateral undercutting - as along a river bank or sea coast - severe slumping ensues. Ice-wedge polygons are found in many low-lying areas of permafrost and are formed by the junction of ice wedges which initiate in tension cracks developed in the surface materials. In size, ice-wedge polygons may range from 5 to 100 ft across and they may possess either high or low centers, depending upon their stage of development. The build-up of hydrostatic pressure in an unfrozen aquifer in permafrost may become so great that water bursts through the overlying beds and freezes on the ground surface. Such icings are winter features, but on melting they leave devastated areas comparable to those created by the passage of small avalanches. The process of solifluction - or downhill creep of soil with a very high water and ice content above the permafrost table is a characteristic feature of periglacial regions. (See also W72-00100) (Woodard-USGS)
W72-00111

STUDY OF ICE-LENS FORMATION PATTERNS (ISSLEDOVANIYE ZAKONOMERNOSTEY FORMIROVANIYA NALEDEY),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02F.
W72-00323

THERMODYNAMICS AND COMPOSITION OF THE LIQUID WATER PHASE IN FROZEN PEAT WITH APPLICATION TO INFILTRATION STUDIES (K VOPROSU O FAXOVOM SOSTAVE VODY I TEPLOFIZICHESKIKH KHARAKTERISTIKAKH MERZLOGO TORFA PRI IZUCHENII INFIL' TRATSII),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02F.
W72-00327

ON THE RATES OF GROWTH OF GRAINS AND CRYSTALS IN SOUTH POLAR FIRN,
Army Terrestrial Sciences Center, Hanover, N.H.
A. J. Gow.
Journal of Glaciology, Vol 8, No 3, p 241-252. June 1969. 6 fig, 3 tab, 24 ref.

Descriptors: *Crystal growth, *Ice, *Firn, Snowpacks, Antarctic, Crystallography, Growth rates, Cryology, Crystallization, Snow.
Identifiers: Firn crystals.

The size of firn crystals as a function of age has been investigated using thin sections to a depth of 49 m at the South Pole. Grain cross-sections increased in size from 0.24 sq mm at 0.1 m depth to 0.63 sq mm at 10 m. Crystals increased in size from 0.18 to 0.43 sq mm over the same interval, implying that grains are generally composed of just one or two crystals rather than several. The mean crystal cross-section increased linearly with the age of the firm at a rate of 0.0006 sq mm per year; in 388 year old firn at 49 m the crystal size measured 0.63 sq mm. Analysis of crystal-growth data from other locations in Antarctica and Greenland also revealed a strong linear relationship between the mean cross-sectional areas of crystals and their ages. The fact that the temperature dependence of the crystal growth rate can be expressed very satisfactorily in an equation of exponential form confirms predictions that crystal growth in firn is essentially analogous to grain growth in metallic and ceramic sinters. Extrapolation of available data indicates that crystal growth rates in dry firn could be expected to vary by two orders of magnitude (0.0003 to 0.03 sq mm per year) over the temperature range -60 degrees to -15 degrees C. A method of utilizing crystal growth-mean annual temperature data to determine accumulation rates in snow is demonstrated. (Knapp-USGS)
W72-00329

ELEXURE OF A FLOATING ICE TONGUE,
Ohio State Univ., Columbus. Inst. of Polar Studies.
G. Holdsworth.
Journal of Glaciology, Vol 8, No 54 p 385-397, October 1969. 5 fig, 15 ref.

Descriptors: *Glaciers, *Ice, *Strain, *Deflection, *Plastic deformation, Deformation, Icebergs, Elastic theory, Shear strength, Compressive strength, Yield strength, Sea ice, Movement.
Identifiers: *Calving (Glaciers).

Several analyses are given for the flexure of a floating polar ice tongue with the general dimensions of several kilometers wide by 200 m in thickness. The lengths considered are from 2 km to in excess of 10 km which is referred to as a long slab. The analyses are made under the separate assumptions that ice behaves as (1) an elastic material (2) an elastic-plastic material, and (3) a fully plastic material, when reacting to flexure due to changes in sea-level. The elastic analysis shows that hinge-line stresses could become very high (of the order of 15 bar) for slab lengths up to 3.5 km reacting to sea level changes of the order of ..50 cm. For slab lengths greater than this, the stresses at the hinge, as well as being significantly less than before, become independent of the length of the slab, dependent only on the slab thickness and the amount of deflection of sea level. In the elastic-plastic analysis, the hinge-line stress cannot exceed a value of about 2 bar. This yield value is reached when sea level departs about 50 cm from the mean. The fully plastic analysis requires more accurate knowledge of the constants in the flow law and their variation with desity, temperature and salinity within the ice. However, the theory may be tested by measuring the diurnal change in strain-rate across the hinge-line zone. The process of calving of large tabular icebergs from such glacier tongues may demand sea level changes of more than lm, or bending about more than one axis of the shelf. (Knapp-USGS)
W72-00330

ALBEDO AND DEGREE OF PUDDLING OF A MELTING COVER OF SEA ICE,
McGill Univ., Montreal (Quebec). Ice Research Project.
M. P. Langleben.
Journal of Glaciology, Vol 8, No 54, p 407-412, October 1969. 2 fig, 11 ref.

Descriptors: *Sea ice, *Melting, *Albedo, Climatology, Remote sensing, Solar radiation, Melt water, Data collections, Heat budget.
Identifiers: Time-lapse photography.

Continuous measurements of incident and reflected short-wave radiation were obtained from 12 May to 17 June 1968 on the ice cover at Tanquary Fiord, Ellesmere Island. The observations were made with radiometers suspended between two towers at a height of 50 ft to sample an area large enough to be representative of the surface of the ice cover. From the start of surface melting, time-lapse photographs were taken at intervals of 3 h with a camera mounted on one of the towers at a height of 20 ft and slanted below the horizontal. Values are presented, for the observation period, of incident short-wave radiation, albedo, air temperature at screen height and percentage of surface covered with melt pools. The albedo decreases linearly with increasing area of water puddles. (Knapp-USGS)
W72-00331

OBSERVATIONS ON A COLLAPSING KAME TERRACE IN GLACIER BAY NATIONAL MONUMENT, SOUTH-EASTERN ALASKA,
Ohio State Univ., Columbus. Inst. of Polar Studies.
G. D. McKenzie.
Journal of Glaciology, Vol 8, No 54, p 413-425, October 1969. 8 fig, 1 tab, 18 ref.

Descriptors: *Geomorphology, *Erosion, *Mass wasting, *Glacial drift, Melt water, Scour, Glaciers, Gravels, Sands, Sediments, Terraces (Geological), Topography.
Identifiers: Kame terraces.

Detailed observations on a kame terrace indicate that the terrace is being reshaped by slumping and sliding of debris into depressions, melt-water erosion on the side of the terrace, debris flows in the gullies, and stagnant-ice bursts. Temperatures in the gravel over the ice, where the gravel is about 4 m thick, indicate that the rate of melting of the upper surface of the ice due to conduction may be as high as 24 cm per year. Highest temperatures in the gravel were recorded during periods of heavy rainfall. (Knapp-USGS)
W72-00332

THE GROWTH OF BONDS AND THE INCREASE OF MECHANICAL STRENGTH IN A DRY SEASONAL SNOW-PACK,
Cold Regions Research and Engineering Lab., Hanover, N.H.
C. M. Keeler.
Journal of Glaciology, Vol 8, No 54, p 441-450, October 1969. 6 fig, 2 tab, 21 ref.

Descriptors: *Snow, *Strength, *Snowpacks, On-site tests, Shear strength, Tensile strength, Compressive strength, Snowfall, Glaciers, Firn, Ice, Density.
Identifiers: Snow metamorphism, Snow strength.

Simultaneous measurements were made of both the strength and structural properties of a dry, seasonal snowpack. The densities of the snow studied ranged from 126 to 407 km per cu m. The mechanical strength of this snow as determined by in situ shear-wave test and a centrifugal tensile test increases exponentially with the increase in size of intergranular sands. Bonding increases at a rate substantially greater than that predicted by the classical sintering equations. It is suggested that this is due to the wide variety of stresses present in snow with these relatively low densities. (Knapp-USGS)
W72-00334

THE MECHANICAL PROPERTIES OF SINGLE CRYSTALS OF PURE ICE,
Birmingham Univ. (England). Dept. of Physics.
S. J. Jones, and J. W. Glen.
Journal of Glaciology, Vol 8, No 54, p 463-473, October 1969. 11 fig, 3 tab, 12 ref.

Descriptors: *Cryology, *Ice, *Strain, *Stress, *Creep, Plasticity, Shear, Compressive strength, Shear strength, Strength of materials, Deformation, Yield strength.
Identifiers: *Ice crystals.

Results obtained from tensile and compressive tests on pure ice single crystals at various temperatures down to-90 degrees C are reported. At-50 degrees C tensile creep tests give a continually increasing creep rate until fracture, as observed at higher temperatures. The stress dependence of the strain-rate is discussed. Fracture stress increases with decreasing temperature. Results from constant strain-rate compressive tests are compared with theoretical curves computed from Johnston's (1962) theory of dislocation multiplication. A dislocation velocity of the order of 5 nanometers / sec was deduced for ice at-50 degrees C. (Knapp-USGS)
W72-00336

2D. Evaporation and Transpiration

EXPERIMENTAL HYDROLOGIC INVESTIGATIONS AT VALDAY (EKSPERIMENTAL'NYYE GIDROLOGICHESKIYE ISSLEDOVANIYA NA VALDAYE).
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02B.
W72-00061

PROCEDURES FOR COMPUTING EVAPORATION FROM 20-SQUARE-METER EVAPORATION PANS BASED ON OBSERVATIONS IN GGI-3,000 EVAPORIMETERS (METODIKA RASCHETA ISPARENIYA S BASSEYNOV PLOSHCHAD'YU 20 M2 PO NABLYUDENIYAM V ISPARITELYAKH GGI-3,000),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
V. I. Kuznetsov.
In: Eksperimental'nyye gidrologicheskiye issledovaniya na Valdaye; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 181, p 3-32, 1970. 7 fig, 12 tab, 15 ref.

Descriptors: *Evaporation, *Evaporation pans, *Bodies of water, Water temperature, Seasonal, Water vapor, Mathematical studies, Statistical methods, Probability.
Identifiers: *USSR, State Hydrologic Institute, Evaporimeters, Pan coefficients, Distribution curves.

Procedures for calculating evaporation from a standard evaporation pan 20 sq m in area for specific monthly periods were based on corrections to evaporation values obtained from measurements in a GGI-3,000 ground-installed evaporimeter designed by the State Hydrologic Institute. Methods for computing water-surface temperature in the pan and corrections to the mean value of the pan coefficient of the GGI-3,000 instrument were described. Calculations were performed to estimate the accuracy of computing monthly evaporation values for the pan under study. Calculated differences were almost symmetrical in distribution and, in most cases, were less than 30% of the true value. The standard deviation was 8%, and the recurrence of differences within 10% and 15% limits was 75% and 87%, respectively. The procedures may be used for evaporation measurement in standard evaporation pans provided observation data are available on evaporation, water-surface temperature, air temperature and humidity, and wind velocity. (See also W72-00061) (Josefson-USGS)
W72-00062

CHARACTERISTICS OF EVAPORATION FROM INDUSTRIAL WASTES (OSOBENNOSTI ISPARENIYA S PROMYSHLENNYKH STOKOV),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 05B.
W72-00063

EFFECT OF PRECIPITATION AND EVAPORATION ON CHANGES IN SOLUTION CONCENTRATION (VLIYANIYE DOZHDEY I ISPARENIYA NA IZMENENIYE KONTSENTRATSII RASTVOROV),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 05B.
W72-00064

ESTIMATION OF INTERCEPTED SOLID PRECIPITATION AND DETERMINATION OF EVAPORATION FROM A SPRUCE FOREST DURING A WINTER PERIOD (OTSENKA VELICHINY ZADERZHANIYA TVERDYKH OSADKOV I OPREDELENIYE ISPARENIYA S YELOVOGO LESA V ZIMNIY PERIOD),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02B.
W72-00065

A GLOBAL CLASSIFICATION OF SOLAR RADIATION,
California Univ., Los Angeles. Dept. of Geography.
W. H. Terjung.
Solar Energy, Vol 13, No 1, p 67-81, April 1970. 8 fig, 1 tab, 11 ref.

Descriptors: *Solar radiation, *Mapping, *Climatic data, *Energy exchange, *Evaporation, Theoretical analysis, Water balance, Fluctuation, Latitudinal studies, Climatic zones, Synoptic analysis, Climatology, Seasonal.

This paper presents an initial attempt at a global classification of solar radiation. Insolation studies are difficult because of relatively scanty data for much of the Earth. This study uses as its data source Budyko's partially theoretical 'Atlas of the Heat Balance of the Earth', which unfortunately does not cover any elevations above 1500 m. Mean monthly values of kilo langleys (kly) are obtained from the maps at latitudinal intervals of 5 degrees and longitudinal intervals of 10 degrees. Additionally, readings were taken at many other points to round out the data base. Altogether, 1123 'stations' were used to construct curves of the annual march of solar radiation over the world. Each of the seasonal curves was analyzed according to it's waveheight, wave fluctuation, wavelength (for latitudes beyond 66 1/2 deg) and phase angle, which is used primarily to specify the months of maximum insolation. Each criterion is mapped, and finally a world-wide map of solar radiation climates is presented. It is stressed that this classification is only a first attempt and that it is subject to many errors that must be considered and corrected in future studies. (Casey-Arizona)
W72-00169

OSMOTIC WATER STRESS: MESOPHYLL SATURATION DEFICIT AND TRANSPIRATION RATES OF TAMARISK,
Minnesota Univ., St. Paul. School of Forestry.
A. C. Mace, Jr.
Southwestern Naturalist, Vol 16, No 1, p 117-120, 23 July 1970. 1 fig, 5 ref.

Descriptors: *Physiological ecology, *Evapotranspiration, *Stomata, *Salinity, *Vapor pressure, Salt balance, Water balance, Plant physiology, Trees, Leaves, Soil-water-plant relationships, Soil moisture, Moisture stress, Solutes, Resistance, Saline soils, Salt tolerance, Saline water, Environmental effects, Mode of action, Laboratory tests, Osmotic pressure, Transpiration, Phreatophytes, Competition, Dominant organisms, *Tamarisk.
Identifiers: *Water potential, *Leaf mesophyll surface, *Salt glands.

Tamarix pentandra Pall. exists and thrives under a wide range of saline conditions that prevent establishment and growth of other species. This may be due to an adaptation for exuding salt through salt glands, thereby reducing solute concentration at the evaporating surface. However, this mechanism has not been isolated and its effect on transpiration rates under high saline conditions is unknown. Estimates of the mesophyll saturation deficit were determined, on the assumption that at zero transpiration the vapor pressure of the evaporating surface of the mesophyll cells was in equilibrium with that of the atmosphere and that stomatal resistance was constant. These estimates indicate that salt accumulation at the evaporation surface of the stomatal cavity is small and little affected by increasing root substrate salinity. Salt glands do provide a mechanism for salt excretion, which if concentrated at the evaporation surfaces, would reduce transpiration rates. High saline content reduced transpiration rates only at high vapor pressure deficits where other resistances within the plant may be affected. (Casey-Arizona)
W72-00172

THE RELATIVE ROLE OF STOMATA IN TRANSPIRATION AND ASSIMILATION,
Australian National Univ., Canberra. Research School of Biological Sciences; and Australian National Univ., Canberra. Dept. of Environmental Biology.
I. R. Cowan, and J. H. Troughton.
Planta, Vol 97, No 4, p 325-336, 1971. 5 fig, 26 ref.

Descriptors: *Stomata, *Transpiration, *Carbon dioxide, *Flow resistance, *Theoretical analysis, Temperature, Boundary layers, Heat transfer, Leaves, Plant physiology, Water vapor, Transpiration control, Chemocontrol.

Evidence exists both for and against the argument that decreases in leaf stomatal aperture decrease assimilation less than transpiration. This argument has great practical import because it is the basis for suggestions that the use of chemical anti-transpirants to partially close stomata might decrease the ratio of transpiration to assimilation in plants. An approach is developed which involves consideration of the resistance to transfer of water vapor and carbon dioxide. It then takes into account the changes in leaf temperature which accompany changes in stomatal resistance. It is shown that when heat and vapor exchanges between leaf and atmosphere are appropriately coupled, resulting in equivalent internal resistance to assimilation and effective resistance to evaporation, then, assimilation and transpiration are equally sensitive to stomatal aperture changes. However, the ratio of transpiration to assimilation generally changes with stomatal aperture as a function of temperature and the relative magnitudes of resistances. It is thought impossible that the ratio may be decreased by artificially induced stomatal closure with crops in the field. (Casey-Arizona)
W72-00175

ECO-PHYSIOLOGICAL STUDIES ON PLANTS IN ARID AND SEMI-ARID REGIONS IN WESTERN AUSTRALIA. III. COMPARATIVE STUDIES OF PHOTOSYNTHESIS, RESPIRATION AND WATER RELATIONS OF TEN ARID ZONE PLANTS UNDER WINTER AND LATE SUMMER CLIMATIC CONDITIONS,
Western Australia Univ., Nedlands. Dept. of Botany.
For primary bibliographic entry see Field 02I.
W72-00176

ON THE GLOBAL SOLAR RADIATION CLIMATE AND EVAPOTRANSPIRATION ESTIMATES IN INDIA,
Meteorological Office, Poona (India).
M. Gangopadhyaya, S. V. Datar, and C. J. George.
Indian Journal of Meteorology and Geophysics, Vol 21, No 1, p 23-30, January 1970. 3 fig, 3 tab, 13 ref.

Descriptors: *Evapotranspiration, *Solar radiation, *Estimating equations, *Climatic data, Energy budget, Heat transfer, Evaporation, Mapping, Data collections, Climatology, Drought.
Identifiers: *India, *Net radiation.

Improved methods for estimating evapotranspiration from meteorological parameters is of prime importance for many agroclimatic investigations, particularly for studies of drought. Pehman's method, the Graphical Coaxial Technique and the McIlroy method are all described. All of these methods require a knowledge of global and net radiation, but direct measurements of these parameters are not usually available. Constants a and b, of the energy budget estimation equation used by Penman, were worked out utilizing available data from 17 radiation stations in India. The average monthly global radiation received at any

low elevation station could then be calculated. It is suggested that by partitioning the Radiation Network by Thiessen's mean method, use can be made of these constants to form estimates of global radiation for any place in India. All of the methods discussed generally give underestimates of evapotranspiration, with greater errors in summer. It was concluded that the Graphical Coaxial Technique gave the best estimates, and work has been undertaken to modify the method to obtain a closer fit with observed values. (Casey-Arizona)
W72-00180

THE EFFECT OF AIR TEMPERATURE AND MOISTURE STRESS UPON LEAF SURFACE TEMPERATURES OF CALOTROPIS PROCERA (WILLD.) R. BR.,
Volcani Inst. of Agricultural Research, Ilanot (Israel). Forestry Div.
For primary bibliographic entry see Field 02I.
W72-00183

DEVELOPMENT OF A STABILITY CORRECTION FOR ESTIMATING CONVECTIVE TRANSFER,
Oregon State Univ., Corvallis. Dept. of Forest Engineering.
For primary bibliographic entry see Field 02B.
W72-00316

2E. Streamflow and Runoff

SUPPRESSION OF CHANNEL-SIDE CHAPARRAL COVER INCREASES STREAMFLOW,
Rocky Mountain Forest and Range Experiment Station, Tempe, Ariz.
For primary bibliographic entry see Field 04A.
W72-00054

SOME SIMPLE DEVICES FOR THE STUDY OF WAVE INDUCED SURGES,
University of Southern California, Los Angeles. Dept. of Gelogical Sciences.
H. J. Summers, H. D. Palmer, and D. O. Cook.
Journal of Sedimentary Petrology, Vol 41, No 3, 861-866, September 1971. 9 fig, 3 ref. ONR Project N00014-67-A-0269-002.

Descriptors: *Waves (Water), *Surges, *Surf, *Instrumentation, *Current meters, Sediment transport, Currents (Water), Data collections.
Identifiers: *Wave recorders.

Surge velocity, generated by waves near bottom in the inner continental shelf, has been measured using the pendulum principle to indicate current strength. Several designs that can be visually observed, record in situ, or using strain gages have been field tested and yield comparable results. These are more effective than rotors or other impellers, since the pendulums respond immediately to the changing stresses. An added advantage is that the instruments can be constructed inexpensively. (Knapp-USGS)
W72-00056

COMPUTER SIMULATION OF THE HYDROLOGIC-SALINITY FLOW SYSTEM WITHIN THE UPPER COLORADO RIVER BASIN,
Utah State Univ., Logan. Utah Water Research Lab.
For primary bibliographic entry see Field 07C.
W72-00084

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR ELM FORK TRINITY RIVER, TRINITY RIVER BASIN, TEXAS, 1969,
Geological Survey, Austin, Tex. Water Resources Div.
For primary bibliographic entry see Field 07C.
W72-00097

INDEX OF SURFACE-WATER RECORDS TO SEPTEMBER 30, 1970--PART 10. THE GREAT BASIN.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-00098

INDEX OF SURFACE-WATER RECORDS TO SEPTEMBER 30, 1970--PART 15. ALASKA.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-00099

INTRODUCTION TO FLUVIAL PROCESSES.
For primary bibliographic entry see Field 02J.
W72-00100

OPEN CHANNEL FLOW,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 08B.
W72-00108

HYDRAULIC GEOMETRY,
Sydney Univ. (Australia). Dept. of Geography.
For primary bibliographic entry see Field 08B.
W72-00109

RELATION OF MORPHOMETRY TO RUNOFF FREQUENCY,
Sydney Univ. (Australia). Dept. of Geography.
G. H. Dury.
In: Introduction to Fluvial Processes, Methuen, London, p 177-188, 1971. 9 fig, 7 ref.

Descriptors: *Streamflow, *Channel morphology, *Channel flow, *Runoff, Hydraulics, Channel erosion, Depth, Shape, Slopes, Width, Hydrogeology, Topography, Meanders, Scour, Sediment transport, Alluvial channels.
Identifiers: *Fluvial processes, *Channel morphometry.

Streamflow characteristics are described in 8 different channel types: meandering, braided, straight, straight-simulating, deltaic-distributary, anabranching, reticulate, and irregular. Braided channels have much greater width/depth ratios than meandering or other single channels. Thus, the highest flow velocities, which occur close to the water surface, are also close to the bed in braided channels. The gradient of velocity from surface to bed is steep, and shear stress on the bed is powerful. Braided patterns are associated with mobile streambeds, which are typically deformed into the roughly diamond-shaped bars which separate the minor low-stage channels. Given mobile bed material of the sand grade or coarser, anything which promotes widening and associated shallowing of the channel is likely to promote braiding. Truly straight channels scarcely exist outside the laboratory, except where a headwater stream is firmly held on the line of a fault. (See also W72-00100) (Woodard-USGS)
W72-00112

CLIMATIC GEOMORPHOLOGY,
Cambridge Univ. (England). Dept. of Geography.
D. R. Stoddart.
In: Introduction to Fluvial Processes, Methuen, London, p 189-201, 1971. 4 fig, 2 tab.

Descriptors: *Geomorphology, *Climates, *Land forming, *Climatic zones, *Alluvium, Erosion, Runoff, Climatology, Climatic data, Weathering, Cold regions, Wet climates, Arid climates, Regions, Meteorology, Weather, Topography, Geology, Precipitation (Atmospheric), Sediment transport.
Identifiers: *Fluvial processes, *Climatic geomorphology.

Climatic geomorphology rests on the assumptions that different climatic inputs in the denudation system result in different landform outputs, and that equilibrium landforms differ between climatic regions in such measurable parameters as drainage density, maximum slope angle, and slope form, as well as in the development of characteristic type-landforms. Most of the analyses made of climatic-morphologic cycles have been highly deductive: and it is possible to construct internally coherent and logically consistent schemes relating climatic characteristics to weathering processes and rates, vegetation types, runoff characteristics, erosion rates, and landform development. If landform development is viewed as the adjustment of form to process in denudation systems, the emphasis of climate at the expense of other factors, particularly lithology and structure, is bound to be distorting. It is possible that at certain scales of landform development climatic parameters are important independent variables, whereas at others they are dependent or not significant. The investigation of such scale-linkages in the correlation structure of diverse denudation systems is the main task facing climatic geomorphology. (See also W72-00100) (Woodard-USGS)
W72-00113

GEOMORPHIC IMPLICATIONS OF CLIMATIC CHANGES,
Colorado State Univ., Fort Collins. Dept. of Geology.
S. A. Schumm.
In: Introduction to Fluvial Processes, Methuen, London, p 202-211, 1971. 5 fig, 6 ref.

Descriptors: *Geomorphology, *Climates, *Land forming, *Runoff, *Alluvium, Temperature, Precipitation (Atmospheric), Sediment yield, Sediment transport, Topography, Geology, Vegetation, Regions, Weathering, Climatology, Meteorology, Weather.
Identifiers: *Fluvial processes, *Climatic geomorphology.

Hydrologic data from the United States are used to demonstrate climatic influences on the quantity of runoff and sediment delivered from drainage basins. A family of curves illustrates the general relation between climate and runoff. The curves show that annual runoff increases as annual precipitation increases. However, runoff decreases as temperature increases with constant precipitation because of increased evaporation and water use by plants. The relations between annual sediment yield, annual precipitation, and temperature for drainage basins averaging about 1,500 square miles are presented. For example, the 50 deg F curve shows the relationship between sediment yield and precipitation adjusted to a mean annual temperature of 50 deg F. Sediment yield is maximum at about 12 inches of precipitation and decreases to lower values with both lesser and greater amounts of precipitation. The variation in sediment yield with precipitation can be explained by the interaction of precipitation and vegetation on runoff and erosion. For example, as precipitation increases above zero, sediment yields increase at a rapid rate, because more runoff becomes available to move sediment. (See also W72-00100) (Woodard-USGS)
W72-00114

STREAMFLOW, SEDIMENT-TRANSPORT, AND WATER-TEMPERATURE CHARACTERISTICS OF THREE SMALL WATERSHEDS IN THE ALSEA RIVER BASIN, OREGON,
Geological Survey, Washington, D.C.
D. D. Harris, and R. C. Williams.
Available from USGS, Wash, DC 20242 - Free on application. Geological Survey Circular 642, 1971. 21 p, 19 fig, 7 tab, 26 ref.

Descriptors: *Hydrologic data, *Streamflow, *Sediment transport, *Water temperature, *Small watersheds, Oregon, Data collections, Precipitation (Atmospheric), Rainfall-runoff relationships, Stream gages, Flow rates, Sedimentation, Peak discharge, Low flow, Suspended load, Particle size, Watershed management.
Identifiers: *Alsea River basin (Oreg).

Data collected for three small watersheds in the Alsea River Basin, Oregon, during the prelogging period 1959-65, indicate an average annual runoff for Needle Branch and Deer and Flynn Creeks of 74.2, 75.1, and 77.7 inches, respectively. The measured precipitation at Flynn Creek of 92.9 inches was 5 inches less than at either Needle Branch or Deer Creek. Unit flood runoff was found to be lowest on Flynn Creek and highest on Needle Branch. On Needle Branch, there appear to be two distinct low-flow patterns, one for a saturated and one for an unsaturated soil condition. The average annual sediment yield was highest on Flynn Creek, 321 tons per square mile, and lowest on Needle Branch, 166 tons per square mile. Maximum water temperatures were 62 deg F on Flynn Creek and 61 deg F on Needle Branch and Deer Creek. (Woodard-USGS)
W72-00115

FLOOD-PLAIN MANAGEMENT MUST BE ECOLOGICALLY AND ECONOMICALLY SOUND,
J. E. Goddard.
Civil Engineering, Vol 41, No 9, p 81-85, September 1971. 6 fig, 2 photo.

Descriptors: *Flood control, *Flood damage, *Watershed management, *Water quality control, *Ecology, Sediment transport, Erosion, Flood protection, Flood forecasting, Wildlife conservation, Fish conservation, Environmental effects, Floodwater, Flood plains, Ecosystems, Water resources development.
Identifiers: *Flood-plain management.

Over the past 35 years in the U.S., some $8 billion has been spent for dams, levees and channelization to limit flood losses. Yet over that same 35 years, losses due to floods have risen. Today, acceptable flood management is of great interest ecologically. In many cases ecologically acceptable--even advantageous--solutions can be found. Some case histories are included. The federal government is moving in the right direction: the federal Water Resources Council was established in 1965 to coordinate the actions of federal agencies; a Presidential Task Force report of 1966 on managing flood losses is gradually being implemented; and in 1970 Congress instructed the Secretary of the Army (Corps of Engineers) to prepare and promulgate by 1972 appropriate guidelines for an ecological impact assessment and statement with each federal project. But the goals are not yet reached. Today developers are asked to fully consider alternative ways to reach goals; this costs more money, manpower, and time than have been available in the past. Engineers and ecologists and environmentalists must work more closely together as partners, and must develop evaluation measures in addition to economic (the dollar is not the only measure of well being). (Woodard-USGS)
W72-00117

AN AUTOMATIC RUNOFF SAMPLER,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 07B.
W72-00118

EXPERIMENTAL STUDY OF CHANNEL PATTERNS,
Colorado State Univ., Fort Collins. Dept. of Geology.
S. A. Schumm, and H. R. Khan.
Nature, Vol 233, No 5319, p 407-409, October 8, 1971. 3 fig, 8 ref.

Descriptors: *Channel morphology, *Alluvial channels, *Model studies, *Flumes, Channel flow, Channel erosion, Slopes, Regime, Shape, Discharge (Water), Hydraulics, Sediment transport, Meanders, Braiding.

Experiments were undertaken to investigate the effect of slope on channel pattern and to determine if at certain ranges of slope, marked changes of channel pattern occur. The experiments were performed in a 30.5 m long, 7.3 m wide, and 1 m deep flume. The flume was filled with sorted sand (median grain size 0.7 mm), which contained particles representative of the complete range of sand sizes. The rate at which sand was fed into the channel was closely related to slope. At slopes less than about 0.2% the channel is straight; at slopes in excess of 0.2%, however, the channel pattern changed as alternate bars formed, and a sinuous thalweg developed. Thalweg sinuosity increased with increased slope and sediment load to a maximum of 1.25 at slopes between 1% and 1.3%. As the slope was increased beyond 1.3%, another change in channel morphology occurred. The alternate bars began to erode, and for slopes of 1.6% and greater a braided channel pattern developed. (Woodard-USGS)
W72-00119

STREAMFLOW ROUTING FOR WATER POLLUTION STUDIES,
Northeastern Univ., Boston, Mass.
For primary bibliographic entry see Field 05G.
W72-00124

INTERPRETATION OF RESULTS FROM THE STUDIES OF POLLUTION OF SURFACE FLOWING WATERS,
Water Economics Research Inst., Wroclaw (Poland). Water Protection Research Section.
For primary bibliographic entry see Field 05A.
W72-00125

HOW DOES FOREST-RANGE CONVERSION IN OZARK UPLANDS AFFECT RUNOFF,
For primary bibliographic entry see Field 04A.
W72-00164

STREAM PRESERVATION IN ARKANSAS.

Report of the State Committee on Stream Preservation, Arkadelphia, Arkansas, February 1969. 123 p, 5 map, 15 photo, 15 tab, 67 ref, 1 append.

Descriptors: *Arkansas, *Streams, *Preservation, *Conservation, Water resources, Water resources development, Recreation, Fish, Fish populations, Wildlife, Wildlife conservation, Fish conservation, Water conservation, Scenery, Riparian plants, Reservoirs, Land resources, Administrative agencies, State governments, Rivers, Wild rivers, Plants, Water quality, Water quality control, Water pollution, Water pollution control.

In order to protect an environment which has diversity and quality as well as quantity for mankind, Arkansas has begun the stream preservation program described in this pamphlet. Various stream developments, such as dams, and their effects are considered, and actions currently being taken for stream preservation are described. Future plans are also delineated. Furthermore, the importance of Arkansas stream preservation to fish, wildlife, and recreational activities is also discussed. A description of those major streams in Arkansas which are to be considered for preservation in their natural state is included. These streams include: (1) Buffalo River, (2) Eleven Point River, (3) Kings River, (4) Mulberry River, (5) Big Piney Creek, and (6) other lesser streams. Technical sections of the pamphlet discuss: (1) the prehistory of the Buffalo River area; (2) the geology of the physiographic resources; (3) plant communities of the Ozarks and Ouachita regions of Arkansas; (4) historical segment counties drained by the Eleven Point, Mulberry, Kings, Buffalo, and Big Piney Rivers; (5) economic and ecological characteristics of Arkansas contiguous to the same rivers; and (6) water quality aspects of stream preservation. A list of ten conclusions and recommendations is provided. (Hart-Florida)
W72-00190

STOCHASTIC DIFFERENCE EQUATION MODELLING OF HYDROLOGIC PROCESSES,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
For primary bibliographic entry see Field 02A.
W72-00306

EFFECT OF RAINFALL ON THE RESISTANCE IN CHANNELS WITH SHALLOW FLOW,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 08B.
W72-00307

CHARACTERISTICS AND FILTERING OF NOISE IN LINEAR HYDROLOGIC SYSTEMS,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
For primary bibliographic entry see Field 02A.
W72-00310

LINEAR SYSTEMS ANALYSIS IN HYDROLOGY--THE TRANSFORM APPROACH, THE KERNEL OSCILLATIONS AND THE EFFECT OF NOISE,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
For primary bibliographic entry see Field 02A.
W72-00317

STUDIES OF SUBSURFACE FLOW (ISSLEDOVANIYA PODZEMNOGO STOKA),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02F.
W72-00319

ANALYSIS OF THE INTERACTION OF RIVER AND SUBSURFACE WATERS (NEKOTORYYE ELEMENTY ANALIZA VZAIMODEYSTVIYA RECHNYKH I PODZEMNYKH VOD),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02F.
W72-00320

ROLE OF ARTESIAN WATER IN THE FORMATION OF STREAMFLOW AS ILLUSTRATED BY THE TOSNA RIVER (OTSENKA ROLI NAPORNYKH PODZEMNYKH VOD V FORMIROVANII RECHNOGO STOKA NA PRIMERE R. TOSNY),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02F.
W72-00321

ACCURACY OF FIELD HYDROMETRIC WORK IN STUDYING SUBSURFACE FLOW (TOCHNOST' EKSPEDITSIONNYKH GIDROMETRICHESKIKH RABOT PRI IZUCHENII PODZEMNOGO STOKA),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02F.
W72-00322

ESTIMATION OF GROUNDWATER RECHARGE BY ATMOSPHERIC PRECIPITATION WITH FEW OR NO OBSERVATIONS OF THE GROUNDWATER REGIME (METOD OTSENKI PITANIYA GRUNTOVYKH VOD ATMOSFERNYMI OSADKAMI PRI NEDOSTATOCHNOSTI ILI OTSUTSTVII NABLYUDENIY ZA REZHIMOM GRUNTOVYKH VOD),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02F.
W72-00324

EFFECT OF INTENSIVE GROUNDWATER USE ON STREAMFLOW (OB ISSLEDOVANII VLIYANIYA INTENSIVNOY EKSPLUATATSII PODZEMNYKH VOD NA STOK REK),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02F.
W72-00325

SURFACE AND SUBSURFACE FLOW INTO RIVERS OF THE WEST SIBERIAN PLAIN (POVERKHNOSTNYY I PODZEMNYY PRITOK V REKI ZAPADNO-SIBIRSKOY RAVNINY),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02F.
W72-00326

PERENNIAL FLUCTUATIONS OF MINIMUM STREAMFLOW IN THE EUROPEAN USSR DURING A WINTER PERIOD (NEKOTORYYE ZAKONOMERNOSTI MNOGOLETNIKH KOLEBANIY MINIMAL'NOGO STOKA REK ETS V ZIMNIY PERIOD),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02F.
W72-00328

EVALUATION OF NATURAL RIVER ENVIRONMENTS: PHASE II,
State Univ. of New York, Binghamton. Research Foundation.
For primary bibliographic entry see Field 06B.
W72-00357

2F. Groundwater

GEOTHERMAL EXPLORATION,
J. W. Crosby, II.
Pap, First Northwest Conference on Geothermal Power, Olympia, Wash, May, 1971. 20 p, 9 ref.

Descriptors: *Geothermal prospecting, *Geothermal studies, Geophysical prospecting, Infrared radiation, Earth resistivity (Electrical), Gravity studies, Seismic studies, Magnetic surveys, Investigations, Exploration, *Resource development, *Thermal energy, Heat flow, Hot springs, Research and development.
Identifiers: *Geothermal investigations, *Geothermal resources, Temperature studies.

Exploration technology for geothermal sources of energy is in its infancy. Original discoveries of geothermal energy have been based primarily on surface manifestations of a deep energy source. Designating areas for detailed exploration of geothermal potential where no surface evidence is present is a demanding challenge to the earth scientist. Detailed studies of regional geology are likely to be the most productive. The better known and partially proven geophysical methods of geothermal investigation discussed are: earth resistivity method, seismic methods, temperature surveys, infrared radiation, gravity surveys, magnetic surveys, and chemical prospecting. Exploration techniques most likely to prove applicable in the State of Washington are suggested. (USBR)
W72-00077

CLASSIFICATION OF PUBLIC LANDS VALUABLE FOR GEOTHERMAL STEAM AND ASSOCIATED GEOTHERMAL RESOURCES,
Geological Survey, Washington, D.C.
L. H. Godwin, L. B. Haigler, R. L. Rioux, D. E. White, and L. J. P. Muffler.
Available from US Geol Survey, Washington D C 20242. Free on application. Geological Survey Circular 647, 1971. 18 p, 2 fig, 1 tab, 3 ref, append.

Descriptors: *Land classification, *Public lands, *Federal jurisdiction, *Geothermal studies, *Steam, Hot springs, Thermal springs, Legal aspects, Water law, Groundwater, Documentation. Identifiers: *Geothermal resources, *Geothermal steam, Geothermal Steam Act of 1970.

The classification standards are presented for determining which Federal lands are classifiable as geothermal steam and associated geothermal resources lands under the Geothermal Steam Act of 1970. The concept of a geothermal resources province is established for classification of lands for the purpose of retention in Federal ownership of rights to geothermal resources upon disposal of Federal lands. A geothermal resources province is defined as an area in which higher than normal temperatures are likely to occur with depth and in which there is a reasonable possibility of finding reservoir rocks that will yield steam or heated fluids to wells. The determination of a 'known geothermal resources area' is made after careful evaluation of the available geologic, geochemical, and geophysical data and any evidence derived from nearby discoveries, competitive interests, and other indicia. The initial classification required by the Geothermal Steam Act of 1970 is presented. (Woodard-USGS)
W72-00096

THE GEOMORPHIC EFFECTS OF GROUNDWATER,
Trinity Coll., Dublin (Ireland). Dept. of Geography.
P. W. Williams.
In: Introduction to Fluvial Processes, Methuen, London, p 108-123, 1971. 9 fig, 24 ref.

Descriptors: *Groundwater movement, *Erosion, *Land forming, *Karst, *Geomorphology, Seepage, Geology, Hydrogeology, Water types, Acidic water, Water chemistry, Geochemistry, Chemical reactions, Meteoric water.
Identifiers: *Fluvial processes.

The geomorphic effects of groundwater, considered as water of meteoric origin within the soil and underlying rocks is discussed. Its distribution is widespread, but since its geomorphic effects operate primarily through solution, its influence is most striking in carbonate terrains. This account of the role of groundwater in modifying the relief focuses attention on limestone and dolomite landscapes where solution manifests itself through karst landforms. The karstic process of solution and concomitant rock settling and collapse is largely directed by geological constraints acting on the passage of subsurface water. Underground water is able to affect topography because of its solvent capacity. The most important solvent in carbonate terrains is carbonic acid, which is produced by the solution of carbon dioxide from the air, and particulary from the soil atmosphere, where the partial pressure of the gas is usually greater. Groundwater in limestone is subdivided into percolation water, vadose stream water, and phreatic water. Each has a different erosive role and a distinctive geomorphic effect. The morphological effects of all styles of groundwater solution tend to lower the relief an average of 0.02-01 mm/yr. (See also W72-00100) (Woodard-USGS)
W72-00107

DISTRIBUTION OF MOISTURE IN THE UNSATURATED PROFILE ON A PIEDMONT WATERSHED,
Clemson Univ., S.C. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 02G.
W72-00308

DITCH DRAINAGE OF ANISOTROPIC NONHOMOGENEOUS POROUS MEDIA: A MODEL STUDY,
Auburn Univ., Ala. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 02G.
W72-00309

MEASUREMENT OF INTERFLOW AND DEEP SEEPAGE ON PIEDMONT WATERSHEDS,
Clemson Univ., S.C.
For primary bibliographic entry see Field 02G.
W72-00311

NATURE AND EXTENT OF MACROPORES IN FOREST SOILS AND THEIR INFLUENCE ON SUBSURFACE WATER MOVEMENT,
Forest Service (USDA), Parsons, W.Va.
For primary bibliographic entry see Field 02G.
W72-00313

STUDIES OF SUBSURFACE FLOW (ISSLEDOVANIYA PODZEMNOGO STOKA),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
O. V. Popov.
Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 182, 1970. 191 p.

Descriptors: *Subsurface flow, *Subsurface runoff, *Subsurface waters, *Surface waters, *Streamflow, Streamflow forecasting, Low flow, Base flow, River flow, Inflow, Discharge (Water), Confined water, Groundwater recharge, Groundwater movement, Aquifers, Hydrogeology, Water storage, Hydrometry, Water resources, Water balance.
Identifiers: *USSR, European USSR, Minimum flow, Groundwater resources, Groundwater use, River waters, Ice lenses, Hydrometric surveys, Mineralization, Regionalization.

This collection of 9 papers is a continuation of the series of monographs published earlier by the State Hydrologic Institute dealing with the subject of subsurface flow in the USSR. (Nos. 114, 122, 133, 139, 154, and 166). Subsurface flow into rivers was examined to develop methods for quantitative evaluation of its basic parameters and to apply the results obtained to hydrologic studies, primarily of minimum flow. Development of modern methods to calculate and forecast streamflow and to study the water regime of river basins may make it possible to use the descriptions of subsurface flow into rivers as an indicator of the hydrogeological conditions of streamflow formation. The aspects of subsurface flow examined include: (1) interaction of surface and subsurface waters; (2) role of artesian water in the formation of streamflow; (3) formation of ice lenses in surface and subsurface waters; (4) groundwater recharge by atmospheric precipitation; (5) effect of intensive groundwater use on streamflow; (6) surface and subsurface flow into rivers of the West Siberian Plain; and (7) perennial fluctuations of minimum streamflow in the European USSR during a winter period. The text material is designed for use by hydrologists, hydrogeologists, hydraulic engineers, and other professionals engaged in water resources and water management studies. (See also W72-00320 thru W72-00328) (Josefson-USGS)
W72-00319

ANALYSIS OF THE INTERACTION OF RIVER AND SUBSURFACE WATERS (NEKOTORYYE ELEMENTY ANALIZA VZAIMODEYSTVIYA RECHNYKH I PODZEMNYKH VOD),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
O. V. Popov.
In: Issledovaniya podzemnogog stoka, Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 182, p 5-25, 1970. 2 fig, 3 tab, 6 ref.

Descriptors: *Surface waters, *Subsurface waters, *Subsurface flow, *Subsurface runoff, *Aurface-groundwater relationships, Base flow, Streamflow, River flow, Surface runoff, Rivers, Discharge (Water), Low flow, Groundwater, Groundwater recharge, Aquifers, Water storage, Regulation, Water resources, Water balance, Hydrographs.
Identifiers: *USSR, River waters, Artesian basins, Regionalization.

The interaction of surface and subsurface waters was examined from the standpoint of (1) estimating groundwater storage, the subsurface component of streamflow, and minimum water discharges of rivers; (2) forecasting streamflow under changing conditions of land reclamation and intensive groundwater extraction; and (3) dewatering excavations in the course of removing mineral deposits. The basic index of the interrelationship of surface and subsurface waters is the coefficient of subterranean flow to rivers, expressed as the ratio of subsurface flow into rivers to total streamflow. The hydrologic evaluation of the relation of subsurface flow to total streamflow and of the minimum discharges of water during periods of low flow may make it possible to apply analytical methods to calculation of subsurface flow into rivers on the basis of other more readily determinable and more carefully examined parameters of streamflow. (See also W72-00319) Josefson-USGS)
W72-00320

ROLE OF ARTESIAN WATER IN THE FORMATION OF STREAMFLOW AS ILLUSTRATED BY THE TOSNA RIVER (OTSENKA ROLI NAPORNYKH PODZEMNYKH VOD V FORMIROVANII RECHNOGO STOKA NA PRIMERE R. TOSNY),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
G. P. Kolesov, and Ye. L. Greyser.
In: Issledovaniya podzemnogo stoka, Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 182, p 26-50, 1970. 6 fig, 1 tab, 15 ref.

Descriptors: *Confined water, *Low flow, *Streamflow, *River flow, *Surface-groundwater relationships, Runoff, Discharge (Water), Hydrographs, Hydrometry, Water level fluctuations, Water levels, Hydrogeology, Groundwater, Groundwater movement, Aquifers, Observation wells, Inflow, Water quality, Chemical analysis.
Identifiers: *USSR, Leningrad Oblast, Tosna River, Hydrometric surveys, Mineralization.

The discharge of artesian waters in a reach of the Tosna River above the city of Tosno, Leningrad Oblast, and at 8 gaging stations on its tributaries was measured as part of a low flow hydrometric survey, conducted in 1967 and again in 1968. The purpose of the measurements was twofold: (1) to determine the percentage of discharge of artesian waters in the average annual flow of the river: and (2) to construct a hydrograph of the artesian portion of the flow. The percentage of artesian flow of the river in 1967 was about 3% of its average discharge, which corresponded to a runoff depth of 5 mm. The artesian contribution to low flow in 1967 was considerable and amounted to one-third the total low flow at the outlet. In other years, as much as 50% of the low flow was derived from artesian sources. During the two years of observations the flow of the Tosna River never dropped below 0.3 cu m/sec. Special hydrogeological calculations and modeling are recommended to study and describe the artesian flow of rivers. (See also W72-00319) (Josefson-USGS)
W72-00321

ACCURACY OF FIELD HYDROMETRIC WORK IN STUDYING SUBSURFACE FLOW (TOCHNOST' EKSPEDITSIONNYKH GIDROMETRICHESKIKH RABOT PRI IZUCHENII PODZEMNOGO STOKA),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
N. S. Ratner.
In: Issledovaniya podzemnogo stoka, Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 182, p 51-72, 1970. 3 fig, 9 tab, 8 ref.

Descriptors: *Hydrometry, *Subsurface flow, *Subsurface runoff, *Discharge (Water), *Flow measurement, Channel flow, Seasonal, Current meters, On-site investigations, Ice.
Identifiers: *USSR, Urals, Chusovaya River, Sim River.

The accuracy of hydrometric work must be evaluated before the hydrometric method can be used for quantitative determination of subsurface discharge into rivers. To evaluate the accuracy of hydrometric work on small rivers of the Chusovaya River basin (Central Urals), measurements were made of 600 water discharges, of which 97 were under complete ice cover conditions and 503 in an open channel. An additional 28 water discharges in an open channel of the Sim River (Southern Urals) were used to check the accuracy of the measurements. The standard deviation in measuring water discharges in the open channel of the two rivers was 5-14% and that in the ice-covered channel of the Chusovaya River, 8-24%. The maximum error in open channel measurements was 9-30% and was not exceeded in 95% of the cases. The significance of the errors in the magnitude of water discharges may be used to improve the organization and procedures of hydrometric work and thereby increase the accuracy of individual measurements. (See also W72-00319) (Josefson-USGS)
W72-00322

STUDY OF ICE-LENS FORMATION PATTERNS (ISSLEDOVANIYE ZAKONOMERNOSTEY FORMIROVANIYA NALEDEY),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
B. L. Sokolov.
In: Issledovaniya podzemnogo stoka, Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 182, p 73-97, 1970. 6 fig, 7 tab, 22 ref.

Descriptors: *Ice, *River flow, *Freezing, *Permafrost, *Frozen ground, Seasonal, Groundwater, Streamflow, Air temperature, Snow cover, On-site investigations.
Identifiers: *USSR, *Ice lenses, Transbaykal, Yakutsk ASSR, Maritime Territory, Soviet Far East, River waters, Suprapermafrost waters.

Basic patterns in the formation of different types of ice lenses during winter periods were derived from field observation data on the volumes and areas of ice lenses in the Northeastern USSR, Transbaykal, Southern and Central Yakutsk ASSR, Maritime Territory, and in the Soviet Far East. Ice lenses may be divided into two classes: (1) ice lenses of river waters; and (2) groundwater ice lenses. Groundwater ice lenses may be classified as (1) groundwater ice lenses of suprapermafrost waters and (2) groundwater ice lenses of underchannel taliks (thawed or unfrozen spots within the permafrost). The areas of ice lenses increase at a greater rate than their volumes. The relative volumes of large ice lenses measuring 2.5-3.5 million cu m increase at approximately the same rate in all stages of ice-lens formation. The ice-lens discharges into rivers during a winter period may be determined by two methods: (1) volume based on the known area of the ice lens; and (2) relative volume and area of the ice lens during the period of its formation. Both methods yield results within accuracy limits of plus or minus 10-20% for ice lenses with areas of 1-4.7 million sq m and with corresponding volumes of 1.8-10 million cu m. In the absence of direct observation data, the magnitude of ice-lens discharges into rivers may be calculated from graphic presentations of the basic characteristics of ice lenses in both absolute and relative terms. (See also W72-00319) (Josefson-USGS)
W72-00323

ESTIMATION OF GROUNDWATER RECHARGE BY ATMOSPHERIC PRECIPITATION WITH FEW OR NO OBSERVATIONS OF THE GROUNDWATER REGIME (METOD OTSENKI PITANIYA GRUNTOVYKH VOD ATMOSFERNYMI OSADKAMI PRI NEDOSTATOCHNOSTI ILI OTSUTSTVII NABLYUDENIY ZA REZHIMOM GRUNTOVYKH VOD),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
V. Ye. Vodogretskiy.
In: Issledovaniya podzemnogo stoka, Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 182 p 98-112, 1970. 2 fig, 2 tab, 5 ref.

Descriptors: *Groundwater, *Groundwater recharge, *Groundwater basins, *Precipitation (Atmospheric), Percolation, Evaporation, Mositure content, Inflow, Soils, Hydraulic properties, Water storage, Zone of aeration, Water balance.
Identifiers: *USSR, Kazakhstan, Kustanay Oblast, Groundwater regime, Moisture exchange.

Atmospheric precipitation and evaporation from the soil are the principal factors governing the inflow of moisture into groundwater as a result of percolation and the outflow of moisture from the groundwater into the ground of the zone of aeration. A method for calculating the exchange of moisture of the soil in the aeration zone with groundwater was based on graphs showing the relationship of moisture exchange to the index of dryness and the depth of groundwater occurrence with adjustment for the effects of the lithological structure of the soils in the zone of aeration. Graphs were constructed on the basis of actual observation data for three basins typical of the Kustanay Oblast in Northern Kazakhstan: lakes Maloye Burli, Borovoye-Zonovo and the Kindeksay Ravine in the basin of Lake Shoshkakul'. The procedures used for quantitative evaluation of the moisture exchange are recommended for studying groundwater recharge in a watershed type of regime. (See also W72-00319) (Josefson-USGS).
W72-00324

EFFECT OF INTENSIVE GROUNDWATER USE ON STREAMFLOW (OB ISSLEDOVANII VLIYANIYA INTENSIVNOY EKSPLUATATSII PODZEMNYKH VOD NA STOK REK),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
B. S. Ustyuzhanin.
In: Issledovaniya podzemnogo stoka, Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 182, p 113-127, 1970. 2 tab, 25 ref.

Descriptors: *Groundwater, *Groundwater movement, *Groundwater recharge, *Groundwater mining, Streamflow, Aquifers, Water storage, Base flow, Channel flow, Discharge (Water), Runoff, Infiltration, Pumping, Hydraulics, Intakes, Surface-groundwater relationships.
Identifiers: *USSR, Groundwater resources, Groundwater use.

The intensive use of groundwater by large cities and the pumpage of water by dewatering systems of mining enterprises lead to changes in groundwater movement and recharge. The use of groundwater in the USSR has reached 95-105 cu km a year, which equals 10-12% of the average annual amount of natural renewable groundwater resources. Methods of evaluating the effects of groundwater use on streamflow are examined and analyzed in the light of the current Soviet and Western literature. The methods examined include: (1) comparison of disturbed flow of one river with data of long-term observations on rivers with a natural water regime; (2) restoration of the natural regime of rivers during pumping of groundwater wells, based on runoff data of several other rivers, using multiple linear correlations; (3) quantitative evaluation of the effect of depression cones on the water regime of rivers by calculating channel flow in individual reaches of the river; (4) calculation of infiltration losses in channel flow by semi-empirical formulas developed primarily for channels; (5) calculation of reduced streamflow under the effects of groundwater pumping in the United States; and (6) calculation of the exchange of water, based on a study of the thermal regime and chemical composition of surface waters and groundwaters. (See also W72-00319) (Josefson-USGS)
W72-00325

SURFACE AND SUBSURFACE FLOW INTO RIVERS OF THE WEST SIBERIAN PLAIN (POVERKHNOSTNYY I PODZEMNYY PRITOK V REKI ZAPADNO-SIBIRSKOY RAVNINY),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
G. A. Plitkin.

In: Issledovaniya podzemnogo stoka, Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 182, p 128-137, 1970. 4 fig, 1 tab, 14 ref.

Descriptors: *Surface runoff, *Subsurface runoff, *Subsurface flow, *Streamflow, *Rivers, Runoff, Discharge (Water), Precipitation (Atmospheric), Groundwater recharge, Aquifers, Water utilization, Water balance, Water resources, Hydrographs, Maps, Surface-groundwater relationships.
Identifiers: *USSR, *West Siberian Plain, Tyumen' Oblast, Sverdlovsk Oblast, Chelyabinsk Oblast, Kurgan Oblast, Tomsk Oblast, Novosibirsk Oblast, Omsk Oblast, Isolines.

The characteristics of surface and subsurface flow into rivers of the West Siberian Plain were examined in relation to the water balance of the area and the economics of water use. The mean annual discharge (in mm of water depth) of surface and subsurface flow into average-size rivers of Western Siberia shown on maps was compared with the average long-term coefficients of these types of runoff. The values of mean annual surface flow into rivers were calculated from the difference in the adjusted mean values of total streamflow and subsurface flow. The values of surface and subsurface flow (in mm and percent of total streamflow) and the values of the coefficients (in percent of precipitation) of these runoff types were defined for the natural zones of the West Siberian Plain and its administrative regions. The data examined provide a picture of the spatial distribution of surface and subsurface flow into average-size rivers and may be used for water resources management studies. (See also W72-00319) (Josefson-USGS)
W72-00326

THERMODYNAMICS AND COMPOSITION OF THE LIQUID WATER PHASE IN FROZEN PEAT WITH APPLICATION TO INFILTRATION STUDIES (K VOPROSU O FAXOVOM SOSTAVE VODY I TEPLOFIZICHESKIKH KHARAKTERISTIKAKH MERZLOGO TORFA PRI IZUCHENII INFIL' TRATSII),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
K. K. Pavlova.
In: Issledovaniya podzemnogo stoka, Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 182, p 138-159, 1970. 7 fig, 8 tab, 19 ref.

Descriptors: *Peat, *Frozen ground, *Frozen soils, *Infiltration, *Thermal properties, Thermodynamics, Thermal capacity, Thermal conductivity, Specific heat, Mositure content, Soil water, Melt water, Ice, Soil temperature, Particle size, Absorption, Cation exchange, Solutes, Porosity, Bogs.
Identifiers: *USSR, Estonian SSR, Mineralization.

The thermal properties and composition of the liquid water phase of frozen peat soils of the Trubezh River floodplain and Tooma Bog Station (Estonian SSR) were examined as a basis for studying the infiltration of water in frozen soils and the interaction of melt water and frozen ground. The content of unfrozen water in peat is determined by (1) temperature of the peat; (2) its particle size, mineralogical composition, absorption capacity, and composition of exchangeable cations; and (3) amount and composition of solutes in the water. The ice content of frozen peat increases with an increase in moisture content and a decrease in temperature. The volumetric thermal capacity of frozen peat increases with an increase in moisture content and decreases with a drop in temperature. The thermal conductivity of frozen peat increases with an increase in moisture content and is virtually independent of temperature. The thermal conductivity of a water-saturated lowland peat approximates that of ice and is 0.005 cal/cm/sec/deg. The thermal conductivity of a frozen sphagnum peat is considerably lower and does not exceed 0.0034 cal/cm/sec/deg at full peat saturation. The infiltration capacity of frozen peat is determined to a great extent by the composition of the soil water. An increase in the ice content of the soil leads to reduced infiltration. (See also W72-00319) (Josefson-USGS).
W72-00327

PERENNIAL FLUCTUATIONS OF MINIMUM STREAMFLOW IN THE EUROPEAN USSR DURING A WINTER PERIOD (NEKOTORYYE ZAKONOMERNOSTI MNOGOLETNIKH KOLEBANIY MINIMAL'NOGO STOKA REK ETS V ZIMNIY PERIOD),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
B. M. Dobroumov.
In: Issledovaniya podzemnogo stoka, Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 182, p 160-183, 1970. 4 fig, 6 tab, 15 ref, append.

Descriptors: *Low flow, *River flow, *Runoff, *Streamflow, *Streamflow forecasting, Runoff forecasting, Average flow, Fluctuation, Seasonal, Correlation analysis, Markov processes, Probability.
Identifiers: *USSR, European USSR, Minimum flow, Variation coefficient, Correlation coefficient, Regionalization.

Long streamflow records for 105 gaging stations in the European USSR were examined to develop integral curves of normalized deviations in minimum winter flow of rivers. The curves were used to describe the perennial fluctuations of runoff and to divide the area into regions according to these fluctuations. A total of 12 regions with synchronous fluctuations of runoff were identified: (1) the Kola-Karelian region; (2) the Arctic region; (3) the Northern region; (4) the Northern Ural region; (5) the Northwestern region; (6) the Central region; (7) the Belorussian-Baltic region; (8) the Central Chernozem region; (9) the Ukrainian-Belorussian region; (10) the Central Ukrainian region; (11) the Carpathian region; and (12) the Southern Ural region. Calculation of the coefficients of variation in the average runoff for n-years was based on Markov chains, which consider the interrelationship of runoff during adjacent years to analyze the recurrence of multiyear wet and dry periods. (See also W72-00319) (Josefson-USGS)
W72-00328

2G. Water in Soils

EXPERIMENTAL HYDROLOGIC INVESTIGATIONS AT VALDAY (EKSPERIMENTAL'NYYE GIDROLOGICHESKIYE ISSLEDOVANIYA NA VALDAYE).
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02B.
W72-00061

FOREST LITTER AS AN ACCUMULATOR OF MOISTURE (LESNAYA PODSTILKA--AKKUMULYATOR VLAGI),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
L. K. Vershinina.
In: Eksperimental'nyye gidrologicheskiye issledovaniya na Valdaye; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 181, p 103-111, 1970. 2 fig, 3 tab, 8 ref.

Descriptors: *Moisture content, *Water storage, *Coniferous forests, *Deciduous forests, Snow cover, Ice, Seasonal, Air temperature.
Identifiers: *USSR, *Forest litter, Valday Hills, Don River, Ice crust, Variation coefficient.

Three forest strips in the area of the Valday Hydrologic Scientific Research Laboratory (VNIGL) and two forest strips in the Don River basin (Voronezh State Forest) were selected to study water storage in forest litter and in ice crust under the litter during the 1968-1969 winter period. Maximum water storage was observed in forest litter of all strips in December and January. Minimum water storage in forest litter occurred during rainless periods in summer. Water storage in litter tended to decrease in the zone of excess moisture whenever the air temperature rose above 5 deg C. Changes in winter and spring water storage of forest litter were the same for various types of forests. Maximum water storage values were recorded in litter of the deciduous forests. Winter water storage in 2- to 7-cm thick litter of the VNIGL forest strips was 10-12 mm, which was about 10% of the measured water storage in the snow cover. Water storage in forest litter of the Don River basin was less and amounted to about 2 mm in the coniferous forest and 5 mm in the deciduous forest. Total water storage in forest litter of the basin and in ice crust under the litter was 7-8mm, which corresponded to 30-40% of the measured water storage in snow on the forest strips. The coefficient of winter water storage in litter of the VNIGL coniferous forests was 0.3-0.4 and that in litter of the deciduous and coniferous forests of the Don River basin, 0.5-0.6. (See also W72-00061) (Josefson-USGS)
W72-00067

METHODS OF CALCULATING MELT-WATER PERCOLATION (SPOSOBY RASCHETA PROSACHIVANIYA TALYKH VOD),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
V. V. Rogotskiy.
In: Eksperimental'nyye gidrologicheskiye issledovaniya na Valdaye; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 181, p 120-137, 1970. 2 fig, 4 tab, 11 ref, 6 append.

Descriptors: *Percolation, *Melt water, *Soil water, *Moisture content, *Soil moisture, Runoff, Water storage, Capillary fringe, Zone of aeration, Heat balance, Water balance, Water table, Thermal conductivity, Heat flow, Thermal properties, Specific heat, Soil temperature, Snowmelt, Lysimeters, Nuclear meters.
Identifiers: *USSR, Water balance equations, Moisture storage.

The moisture-thermal regime of soils of the zone of aeration was examined during a period of spring snowmelt (1968) to develop a method of calculating the percolation of melt water for areas with uniform soil and hydrogeological conditions. To study the percolation of melt water, an agricultural field of the Valday Hydrologic Scientific Research Laboratory was equipped with (1) GR-80 lysimeters operating at depths of 100, 150, 200, and 250 cm, (2) an NIV-1 neutron moisture meter, and (3) a set of thermometers installed 20, 40, 80, 160, and 320 cm beneath the soil surface. A water-heat balance equation for a unit column of soil and working formulas for determining the components of this equation are given to define changes in the temperature and moisture storage of the soils during snowmelt. The water-heat balance method is preferred to water balance equations for calculating soil-moisture storage and melt-water percolation beyond the soil layer examined in cases where (1) the water table coincides with the capillary fringe; (2) the depth of moisture-storage measurements is limited; and (3) no data are available on surface runoff or on other elements of the water balance. To refine the water-heat balance method, it is necessary (1) to increase the accuracy of temperature and moisture-storage measurements in individual layers of the soil and (2) to make direct thermometer measurements of heat flows at the upper and lower boundaries of the zone of aeration. (See also W72-00061) (Josefson-USGS)
W72-00068

INFILTRATION RATES AND GROUNDWATER QUALITY BENEATH CATTLE FEEDLOTS, TEXAS HIGH PLAINS,
Texas Tech Univ., Lubbock. Dept. of Geoscience.
For primary bibliographic entry see Field 05B.
W72-00083

GIBBSITE IN COASTAL PLAIN SOILS, SOUTHEASTERN UNITED STATES,
Alabama Geological Survey, University.
O. M. Clarke, Jr.

Southeastern Geology, Vol 13, No 2, p 77-90, September 1971. 3 fig, 2 tab, 19 ref.

Descriptors: *Soil formation, *Clay minerals, *Weathering, *Provenance, Kaolinite, Clays, Geomorphology, Mineralogy, Soil chemistry, Leaching, Oxidation, Soil investigations, Iron, Paleoclimatology, Atlantic coastal plain.
Identifiers: *Bauxite, *Gibbsite, Hematite.

Gibbsite, kaolinite, interlayered vermiculite, and hematite occur in soils of the Coastal Plain in southeastern United States, forming the clay fraction of a soil zone 2 to 5 meters thick. These soils, which contain six percent or more gibbsite in the B and Cl soil horizon, occur as erosional remnants on uplands underlain by sand and gravel of the Citronelle Formation and high terrace deposits. They are restricted to a belt that extends from southern Mississippi, through the southwestern corner of Alabama, northwestern Florida, northeastern corner of Alabama, into west-central Georgia. Similar soils that contain very little or no gibbsite occur in the Coastal Plain beyond the gibbsite soils. Possible source materials for gibbsite are weathered feldspathic rocks of the Piedmont physiographic province and clay in the Coastal Plain sediments. Bauxite deposits of early Eocene age, apparently, are not related to the gibbsite soil because they are separated from the gibbsite soils by unweathered marine sediments. Laterization probably occurred during the Pliocene, because intensely weathered soil overlies Miocene sediments and the lower terraces of Pleistocene age are not laterized. (Knapp-USGS)
W72-00090

SOIL MOISTURE,
McGill Univ., Montreal (Quebec). Dept. of Geography.
M. A. Carson.
In: Introduction to Fluvial Processes, Methuen, London, p 74-84, 1971. 8 fig, 16 ref.

Descriptors: *Soil moisture, *Erosion, *Sediment transport, *Hydrogeology, Soil properties, Weathering, Alluvium, Soil types, Soil water movement, Soil physics, Topography.
Identifiers: *Fluvial processes, Denudation.

The part played by soil moisture in some aspects of the denudation of the landscape is outlined. The most obvious part played by soil moisture is the assistance given in the weathering of solid rock masses into loose debris and the direct transport of material as solutes and colloids out of the waste mantle. Soil moisture also influences denudation of the landscape by landslides and, through the attainment of particular values of pore pressures, may lead to lowering of angles of limiting slope in any one area. A hillside which is stable against rapid mass-wasting is not immune to still further transport of debris downslope through moisture-induced soil creep. There are two types of soil creep which act upon hillslopes. One is the unidirectional movment downslope under the impetus directly of gravity and designated as shear creep. The rate of this type of movement is very slow. Superimposed upon this continuous creep is seasonal soil creep. This is produced by random and cyclic disturbances which operate on flat land as well as on slopes. The major mechanism underlying movement in seasonal soil creep in humid temperate areas is the expansion and shrinkage of soils with changes in the moisture content of the soil. (See also W72-00100) (Woodard-USGS)
W72-00104

INFILTRATION, THROUGHFLOW, AND OVERLAND FLOW,
Bristol Univ. (England). Dept. of Geography.
M. J. Kirkby.
In: Introduction to Fluvial Processes, Methuen, London, p 85-97, 1971. 6 fig, 3 tab, 14 ref.

Descriptors: *Rainfall, *Infiltration, *Groundwater movement, *Overland flow, *Rainfall-runoff relationships, Hydrologic equation, Hydrologic properties, Soil properties, Vegetation, Topography, Hydrogeology, Transmissivity, Surface runoff, Slopes, Regime.
Identifiers: *Fluvial processes.

The characteristics of infiltration, throughflow, and overland flow of rainfall are discussed. When the rainfall that has not been intercepted by vegetation reaches the ground surface, part of it fills small surface depressions (depression storage), part percolates into the soil, and the remainder, if any, flows over the surface as overland flow. Each component of this equation is highly variable, and depends not only on the intensity of the rainfall but also on soil, vegetation, and surface gradient. The amount of water intercepted by vegetation depends on the type of plants and their stage of growth, but it is usually close to a value given by all of the first 1.0 mm of rainfall and 20% of the subsequent rainfall in any one storm. Rainfall reaching the soil surface has to fill the small depressions on the surface before any overland flow can occur, even on a totally impermeable surface. This depression storage does not vary with the amount of rainfall but with the nature of the surface, especially with slope gradient, vegetation cover, and land-use practices. Under natural conditions depression storage absorbs about 2-5 mm of rainfall in any one storm. Contour plowing is particularly effective in increasing depression storage by as much as ten times. (See also W72-00100) (Woodard-USGS)
W72-00105

DISTRIBUTION OF MOISTURE IN THE UNSATURATED PROFILE ON A PIEDMONT WATERSHED,
Clemson Univ., S.C. Dept. of Agricultural Engineering.
J. T. Ligon, and T. V. Wilson.
Paper No 71-251 presented at the 1971 Annual Meeting of American Society of Agricultural Engineers, Washington State University, June 27-30, 1971. 25 p, 16 fig, 5 ref. OWRR Project A-014-SC (2).

Descriptors: *Soil moisture, *Soil profiles, *Groundwater recharge, *Groundwater movement, *Geology, Regional analysis, South Carolina, Water table, Water level fluctuations, Hydrographs, Aquifers, Unsaturated flow, Clays, Seepage, Precipitation (Atmospheric), Surface-groundwater relationships.
Identifiers: *Piedmont soils.

Soil moisture data to a depth of 32 feet in a typical Piedmont soil profile are presented for a 17-month period including two winter-spring recharge periods. Seasonal fluctuations at given depths as well as changes in profile storage over selected time periods are included. The Southern Piedmont Land Resource area forms a belt extending southwesterly from North Carolina, across South Carolina and Georgia, and into Alabama. A soil zone of relatively high clay content constituting the B2t horizon acts as a restricting layer in this typical Piedmont soil. However, the rate of percolation through this layer is not extremely low, and water does move through to recharge the deep soil moisture and groundwater. An annual rise in the water table may fail to occur, as in the 1969-70 winter-spring season, if the downward seepage is slow and the water table relatively high initially. Even though a rise did not occur this particular season, an increase in seepage was indicated by the leveling out of the groundwater hydrograph. (Woodard-USGS)
W72-00308

DITCH DRAINAGE OF ANISOTROPIC NON-HOMOGENEOUS POROUS MEDIA: A MODEL STUDY,
Auburn Univ., Ala. Dept. of Agricultural Engineering.
E. W. Rochester, Jr., and G. J. Kriz.
American Society of Agricultural Engineers Transactions, Vol 13, No 5, p 626-628, 1970. 8 fig, 2 ref. OWRR B-006-NC (2).

Descriptors: *Groundwater movement, *Seepage, *Open channel flow, *Porous media, *Model studies, Drainage, Ditches, Hydraulic conductivity, Soil properties, Aquifers, Water level fluctuations, Hydrologic data, Infiltration, Groundwater recharge, Mathematical studies.

The rate of all of the water table midway between open drains depends on the hydraulic conductivity of the soil, drain spacing, existence of an impermeable layer, and degree of anisotropy and non-homogeneity of the soil. The critical depth of an impermeable layer below equally spaced parallel drains was determined for a homogeneous and a two-layered isotropic soil. The results were mapped mathematically to the anisotropic case. The effect of the impermeable layer was determined by observing the rate of fall of the fluid free surface at the midpoint of a Hele-Shaw model. For a homogeneous isotropic soil the critical depth to the impermeable layer was one-ninth the spacing. (Woodard-USGS)
W72-00309

MEASUREMENT OF INTERFLOW AND DEEP SEEPAGE ON PIEDMONT WATERSHEDS,
Clemson Univ., S.C.
T. V. Wilson, and J. T. Ligon.
Clemson University Water Resources Research Institute Report, 1971. 12 p, 5 fig. OWRR Project A-014-SC (1) and B-008-SC (1).

Descriptors: *Soil water movement, *Hydrologic data, *Instrumentation, *Data collections, *South Carolina, Rainfall, Runoff, Seepage, Infiltration, Soil properties, Evaporation, Saturation, Unsaturated flow, Watersheds (Basins).
Identifiers: *Piedmont soils (SC), *Interflow.

The occurrence of interflow, its rate and volume, and the rate of downward movement of water in the Clemson Research Watershed (South Carolina), including methods and instrumentation, are reviewed. The soils are typical upper Piedmont with a thin topsoil underlain by 3-5 feet of heavy, slowly permeable subsoil which gradually blends into the 'C' horizon. Bedrock varies in depth from about 50 feet near the upper elevation to more than 100 feet at some locations. Slope ranges from level to about 13%, averaging about 8%. Data from tensiometers show a trend toward decreasing tension downslope, indicating increasing moisture downslope. Soil moisture content is measured in the four access tubes at depths of 6, 12, 18 and 24 inches and increments of 12 inches down to the depths of the tubes. Comparisons of the profile moisture contents on different dates are shown. Between October 19, 1970 and January 11, 1971, 11.64 inches of rainfall exceeded evapotranspiration by several inches. This moisture penetrated to a depth of about 12 feet. Below this level, slow drainage reduced the moisture content of the profile. (Woodard-USGS)
W72-00311

EFFECT OF TEMPERATURE ON PRESSURE HEAD-WATER CONTENT RELATIONSHIP AND CONDUCTIVITY OF TWO SOILS,
Mississippi State Univ., State College. Dept. of Agronomy.
M. Haridasan.
PhD Thesis, Mississippi State University Department of Agronomy, August 1971. 66 p, 19 fig, 3 tab, 48 ref. OWRR B-002-MISS (2).

Descriptors: *Soil water movement, *Soil moisture, *Pressure head, *Temperature, *Hydraulic conductivity, Laboratory tests, Analytical techniques, Soils, Silts, Loam, Saturated soils, Unsaturated flow, Steady flow.
Identifiers: Steady state, Pressure plate outflow.

A series of experiments was conducted in the laboratory to study the effect of temperature on the pressure head-water content relationship and the hydraulic conductivity as a function of water content and pressure head in two soils. Hydraulic con-

ductivity of two silt loams were determined as a function of water content and pressure head at constant temperatures of 15, 25, and 35 deg C by steady state and pressure plate outflow methods. The pressure head at a given water content increased as the temperature increased. The maximum changes were observed in the region of inflection of the desorption curves. The water content at a given pressure head decreased with a rise in temperature. Conductivity of the soils at saturation increased as the temperature increased and conductivity of unsaturated soils at a given water content increased with a rise in temperature. The pressure plate outflow method seemed to be more suitable for laboratory determination of hydraulic conductivity of unsaturated soils than the steady-state method. Data obtained by the pressure plate outflow method were more consistent and required considerably less time to obtain conductivity as a function of soil water content. (Woodard-USGS)
W72-00312

NATURE AND EXTENT OF MACROPORES IN FOREST SOILS AND THEIR INFLUENCE ON SUBSURFACE WATER MOVEMENT,
Forest Service (USDA), Parsons, W.Va.
G. M. Aubertin.
Forest Service Northeast Forest Experiment Station Paper NE-192, 1971. 33 p, 5 fig, 3 tab, 37 ref, append.

Descriptors: *Groundwater movement, *Soil water, *Pores, *Forest soils, Soil properties, Soil water movement, Root systems, Hydraulic conductivity, Porous media, Saturated soils, Seepage.
Identifiers: *Macropores.

Rain falling on a sloping forested soil may enter the soil quickly and move considerable distances through the soil by way of macropores. A macropore is a large pore, cavity, passageway, channel, tunnel, or void in the soil, through which water usually drains by gravity. Qualitative and semiquantitative observations of outflow from the pit faces of soil masses receiving artificial rainfall containing fluoresceine dye showed that in fine textured soils many old root channels rapidly conduct free water through the soil mass without wetting the soil mass proper. Onset of outflow after the beginning of rainfall was normally rapid, often beginning within 10 to 15 minutes. Volume of outflow per location was frequently high, exceeding 1,000 ml/min. That free water can rapidly move substantial distances through relatively dry soil was demonstrated by an observation of seepage occurring from a pit face some 30 feet obliquely downslope from the pit under study. The seepage commenced between 30 and 45 minutes after starting to wet the forest floor above the observation pit. (Woodard-USGS)
W72-00313

THERMODYNAMICS AND COMPOSITION OF THE LIQUID WATER PHASE IN FROZEN PEAT WITH APPLICATION TO INFILTRATION STUDIES (K VOPROSU O FAXOVOM SOSTAVE VODY I TEPLOFIZICHESKIKH KHARAKTERISTIKAKH MERZLOGO TORFA PRI IZUCHENII INFIL' TRATSII),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02F.
W72-00327

ESTIMATING SOIL PERMEABILITY RATES,
Harza Engineering Co., Chicago, Ill.
M. E. Horn.
Proc Amer Soc Civ Eng, J Irrig Drain Div, Vol 97, No IR2, pp 263-274, June 1971. 12 p, 3 fig, 6 tab, 8 ref, append.

Descriptors: *Drainage, Irrigation, *Permeability, *Seepage, Hydraulic conductivity, Soil chemistry, Soil mechanics, *Soil texture, Wetlands, Soil classifications, Soil physical properties, Infiltration, Subsurface drainage, Soil compaction, Seepage losses, Particle distribution, Saline soils, Percolation, Clay minerals.

A guide for estimating soil permeability rates was developed based on mean soil particle diameters, and takes into account the wide ranges within commonly used soil textural classes and the influence of soil chemical properties, clay permeability. Curves plotted on a log-log graph of soil texture versus permeability establish graphically the general limits of permeability rates for natural soils. Considerations in selecting working curves that relate soil texture and permeability rates for local conditions are discussed. Estimating permeability rates is necessary in planning and designing irrigation and drainage systems when obtaining field measurements is difficult and impractical, or when available data are scant and misleading. (USBR)
W72-00345

STRESS STRAIN CHARACTERISTICS OF A SATURATED CLAY SOIL AT VARIOUS RATES OF STRAIN,
A. M. El-Domiaty, and W. J. Chancellor.
Trans Asae (Amer Soc Agr Eng). 13 (5): 1970. 685-689. Copyright 1971, Biological Abstracts, Inc.
Identifiers: Clay, Culture, Mechanization, Rates, Rice-M, Saturated, Soil, Strain, Strength, Stress.
W72-00546

DISCUSSION OF STRESS CHARACTERISTICS OF A SATURATED CLAY SOIL AT VARIOUS RATES OF STRAIN,
Y-T Chou.
Trans Asae (Amer Soc Agr Eng). 13 (5): 1970. 690. Copyright 1971, Biological Abstracts, Inc.
Identifiers: Clay, Rates, Saturated, Soil, Strain, Stress.
W72-00547

2H. Lakes

TENTATIVE APPLICATION OF A TELETHERMOMETER FOR MEASUREMENT OF WATER-SURFACE TEMPERATURE (OPYT PRIMENENIYA DISTANTSIONNOY USTANOVKI DLYA IZMERENIYA TEMPERATURY POVERKHNOSTI VODY),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
A. V. Piotrovskiy.
In: Eksperimental'nyye gidrologicheskiye issledovaniya na Valdaye; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 181, p 174-191, 1970. 6 fig, 6 tab.

Descriptors: *Thermometers, *Water temperature, *Measurement, *Telemetry, Calibrations, Instrumentation, Bridges (Electric), Electrical resistance, Evaporation pans.
Identifiers: *USSR, *Telethermometers, Thermostats, Thermistors, Sensors.

Remote measurements of water temperature were made by using a telethermometer equipped with thermistor sensors located on a raft on Lake Valday. The range of measured temperatures was minus 10 to plus 40 deg C. The accuracy of temperature measurement was plus or minus 0.2 deg C. Calibration of the instrument was in two stages: (1) balancing of bridge circuits against known temperatures; and (2) calculation of temperatures on the basis of data transmitted from the raft. Measurements of water-surface temperatures obtained by remote procedures were compared with temperatures obtained from mercury thermometers in evaporation pans on the raft. Errors in measuring the average ten-day temperature of the water surface did not, in most cases, exceed 0.4 deg C. Three possible causes of errors in measurement were indicated: (1) the disrupting effect of the plastic float on readings of the telethermometer; (2) the presence of vertical temperature gradients in the surface layer of water in the pans and the absence of these gradients in the thermostat during calibration; and (3) the shunting effect of the line of communications. The instrument examined for remote measurement of water temperature may be considered to have practical application. (See also W72-00061) (Josefson-USGS)
W72-00070

INDEX OF SURFACE-WATER RECORDS TO SEPTEMBER 30, 1970--PART 10. THE GREAT BASIN.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-00098

INDEX OF SURFACE-WATER RECORDS TO SEPTEMBER 30, 1970--PART 15. ALASKA.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-00099

CHEMICAL AND BIOLOGICAL CONDITIONS IN BALD EAGLE CREEK AND PROGNOSIS OF TROPHIC CHARACTERISTICS OF FOSTER JOSEPH SAYERS RESERVOIR, CENTRE COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, Pa., Water Resources Div.
For primary bibliographic entry see Field 05C.
W72-00129

EFFECTS OF ZOOPLANKTON ON ALGAE IN WESTHAMPTON LAKE,
Richmond Univ., Va. Dept. of Biology.
For primary bibliographic entry see Field 05C.
W72-00150

NITROGEN CYCLE AND PRIMARY PRODUCTION IN MESOTROPHIC LAKE LUCERNE (HORWER BAY) AND IN EUTROPHIC RED LAKE WITH SPECIAL REGARD TO NITRATES AS LIMITING FACTORS (STICKSTOFF--KREISLAUF UND PRIMAPRODUKTION IM MESOTROPHEN VIER-WALDSTATTRSEE (HORWER BUCHT) UND IM EUTROPHEN ROTSEE, MIT BESONDERER BERUCKSICHTIGUNG DES NITRATS ALS LIMITIERENDEN FAKTORS),
Eidgenoessiche Anstalt fur Wasserversorgung, Abwasserreinigung and Gewaesserchurtz, Zurich (Switzerland).
For primary bibliographic entry see Field 05C.
W72-00158

DYNAMICS OF THE NITROGEN CYCLE IN LAKES,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 05C.
W72-00354

FOOD OF 3 SPECIES OF SUNFISHES LEPOMIS CENTRARCHIDAE AND THEIR HYBRIDS IN 3 MINNESOTA LAKES,
D. A. Etnier.
Trans Amer Fish Soc. 100 (1): 1971. 124-128. Copyright 1971, Biological Abstracts, Inc.
Identifiers: Centrachidae, Food, Hybrids, Invertebrates, Lakes, Lepomis, Lepomis-Cyanellus, Lepomis-Gibbosus, Lepomis-Macrochirus, Minnesota, Species, Sunfishes, USA.
W72-00524

A 1 YEAR STUDY OF PRIMARY PRODUCTION IN LAKE SKADAR,
D. Milovanovic.
Arch Biol Sci. TT67 (58013/3-4). 1970. 73-87. Copyright 1971, Biological Abstracts, Inc.
Identifiers: Lake, Physiochemical, Primary, Production, Skadar, Year, Yugoslavia.
W72-00532

2I. Water in Plants

THE RELATIVE ROLE OF STOMATA IN TRANSPIRATION AND ASSIMILATION,
Australian National Univ., Canberra. Research School of Biological Sciences; and Australian National Univ., Canberra. Dept. of Environmental Biology.
For primary bibliographic entry see Field 02D.
W72-00175

ECO-PHYSIOLOGICAL STUDIES ON PLANTS IN ARID AND SEMI-ARID REGIONS IN WESTERN AUSTRALIA. III. COMPARATIVE STUDIES OF PHOTOSYNTHESIS, RESPIRATION AND WATER RELATIONS OF TEN ARID ZONE PLANTS UNDER WINTER AND LATE SUMMER CLIMATIC CONDITIONS,
Western Australia Univ., Nedlands. Dept. of Botany.
E. O. Hellmuth.
Journal of Ecology, Vol 59, No 1, p 225-259, March 1971. 6 fig, 8 tab, 22 ref.

Descriptors: *Xerophytes, *Physiological ecology, *Transpiration, *Photosynthesis, *Water balance, Temperature, Leaves, Arid lands, Plant physiology, Stomata, Moisture stress, Air temperature, Carbon dioxide, Light intensity, Respiration, On-site data collections, Biological communities, Climatic data, Rainfall, Soil types, Diurnal, Seasonal, Environmental effects, Mode of action, Soil moisture, Water loss, Soil-water-plant relationships.
Identifiers: *Western Australia, *Sclerophyllic plants, *Succulent plants.

For 5 years (1965-1969) Western Australian xerophyte studies on carbon dioxide exchange, water relations and heat resistance, have been conducted under conditions of optimal soil moisture (field capacity in the 5-15 cm soil layer in winter or spring) and under conditions of stress (soil water potential between -40 and -140 atm in the same soil layer in late summer). The data obtained were used to compare sclerophylls, succulents and mesomorphs. In late summer all species showed a positive carbon dioxide balance, indicating sufficient soil moisture in deeper soil layers. Negative balances were observed only in non-mature, senescent plants. The excess carbon dioxide assimilation during this period was used in some species for flower or fruit production, or for leaf cell wall synthesis in other species. With increasing moisture and temperature stress, water use efficiencies deteriorated in most species except the Acacias. Diurnal patterns paralled each other and the late summer curves for net photosynthesis and transpiration, with several peaks, could be explained by stomatal closure due to critical water deficits or leaf temperatures beyond the critical optimum for net photosynthesis. Cardinal leaf temperatures and cardinal light intensities were obtained and the data was used to develop relationships predicting diurnal carbon dioxide curves. Five different seasonal net photosynthesis-transpiration types were determined. Under optimal conditions, semi-succulent, glabrous and mesomorph species showed the highest physiological activity followed by sclerophylls-phyllodinous species (Acacias). Under stress conditions, physiological diversity occurred. (Casey-Arizona)
W72-00176

MODEL FOR ISO-OSMOTIC WATER FLOW IN PLANT ROOTS,
California Univ., Los Angeles. Dept. of Botanical Sciences.
H. Ginsburg.
Journal of Theoretical Biology, Vol 32, No 7, p 147-158, July 1971. 1 fig, 1 tab, 34 ref.

Descriptors: *Model studies, *Root systems, *Osmotic pressure, *Soil-water-plant relationships, Ions, Solutes, Transpiration, Plant growth, Metabolism, Plant physiology, Biological membranes, Biological properties, Water balance, Mode of action, Flow, Root development.

When the osmolarities of an exuding, excised plant root and a bathing external solution are equal, there will still be an inward fluid flow to the roots called iso-osmotic water flow (IOWF). The flow and the excess osmotic pressure required to stop it can be reduced by metabolic inhibitors and anaerobic conditions. Although the IOWF is unimportant in the overall water balance of a mature plant, its existence has served to lend credence to the possibility of an active water pump in the root cortex. This paper suggests a mechanistic model, based on the symplast theory, which does not necessitate a 'water pump' to explain the IOWF. The model shows that although the root cortex (or together with the stele) is transporting water actively as an organ, the mechanism underlying this process is based on osmotic and hydrostatic driving forces combined with different hydraulic conductivities at the boundary membranes. It also explains the effects of metabolic inhibitors and anaerobic conditions. The conclusions are consistent with data from the literature. It is speculated that the IOWF may be of paramount importance in the first stages of seedling growth, preventing transfer of solutes to the growing shoot. It may also be important in reducing water stress due to transpiration in young differentiating rootlets. (Casey-Arizona)
W72-00178

VEGETATION STUDIES IN THE SIMPSON DESERT, N.T.,
Commonwealth Scientific and Industrial Research Organization, Camberra (Australia). Rangelands Research Unit.
A. M. Wiedemann.
Australian Journal of Botany, Vol. 19, No 1, p 99-124, April 1971. 6 fig, 5 tab, 33 ref.

Descriptors: Plant populations, *Ecological distribution, *Arid lands, *Xerophytes, *Dunes, Soil types, Sands, Moisture stress, Biogeography, Biological communities, Deserts, Water balance, Rainfall, Seasonal, Plant growth, Habitats, Bionomics.
Identifiers: *Australia, *Simpson Desert, *Transects, *Associational analyses, *Information content (Ecology).

The Simpson Desert is a large arid expanse in the interior of the Australian continent. No previous studies of Simpson Desert Vegetation have been undertaken, and this paper is a report of a vegetation study carried out on a dune area in the SW part of the Desert. A transect of continuous quadrats was used in the vegetation surveys, and associational analyses were accomplished by using computer programs in which the initial quadrat group is subdivided into successively more homogeneous groupings of quadrats in a descending hierarchy. Quadrats were reduced on the basis of greatest heterogeneity reduction, thereby using heterogeneity as a measure of information content. The study was carried out after a period of abundant winter rainfall which resulted in optimum growth conditions for both ephemeral and perennial species. Seven habitat types could be distinguished: swale hard clayey sand, lower slope clayey sand, mid-slope clayey sand, mid-slope Triodia mound, upper slope loose sand, steep slope loose sand, upper slope loose sand and crest mobile sand. Rather than sharply defined plant communities corresponding to these habitat types, the species groupings tended to form a continuum from swale to crest. Frequency data were analyzed for 729 quadrats. The present vegetation of the dunes is stable, with a cycle of relatively short wet periods dominated by ephemeral species, alternating with long dry periods dominated by perennials. There is little to suggest that the vegetation is important in maintaining the stability of the sand dunes. (Casey-Arizona)
W72-00182

THE EFFECT OF AIR TEMPERATURE AND MOISTURE STRESS UPON LEAF SURFACE TEMPERATURES OF CALOTROPIS PROCERA (WILLD.) R. BR.,
Volcani Inst. of Agricultural Research, Ilanot (Israel). Forestry Div.
R. Karschon, and L. Pinchas.
Oecologia Plantarum, Vol 6, No 1, p 43-50, 1971. 4 fig, 2 tab, 5 ref.

Descriptors: *Xerophytes, *Transpiration, *Cooling, *Leaves, *Temperature, Shrubs, Phreatophytes, Arid lands, Plant physiology, Climatic data, Moisture stress, Soil-water-plant relationships, Air temperature, Water loss, Heat balance, Thermal stress, Water balance.

Leaf temperature and moisture content determinations were made in the Jordan Rift Valley in the months of May, August, November and February. In a small scale experiment, 2 groups of 1-year old 30-cm-tall plants were irrigated up to 2 and 3 days before measurement. At different times of the year, leaf temperatures were greater than air temperatures (overtemperatures), cooler than air temperature (undertemperature) or both. During the driest time of the year undertemperatures occurred, indicating an adequate soil moisture supply to these phreatophytes. A close relationship between the leaf temperature-air temperature difference and air temperature apparently reflects the influence of meteorological conditions rather than plant hydration upon transpiration rates. However, the data of the nursery experiment clearly show that moisture stress has a direct effect upon leaf heating rates. It was concluded that, in general, the leaf-air temperature difference is closely related to plant hydration, except in those rare cases of extremely favorable soil moisture conditions where meteorological factors may control transpiration rates. (Casey-Arizona)
W72-00183

SOME ASPECTS OF WATER BALANCE IN TENEBRIONID BEETLES AND A THYSANURAN FROM THE NAMIB DESERT OF SOUTHERN AFRICA,
California Univ., Riverside. Dept. Life Sciences.
E. B. Edney.
Physiological Zoology, Vol 44, No 2, p 61-76, April 1971. 6 fig, 3 tab, 34 ref.

Descriptors: *Xerophilic animals, *Insects, *Physiological ecology, *Arid lands, *Water balance, Moisture stress, Ecological distribution, Humidity, Transpiration, Niches, Habitats, Water conservation, Animal physiology, Animal behavior, Water loss, Modes of action, Environmental effects, Insect behavior, Cuticle, Dehydration, Epidermis, Moisture uptake, Water loss.
Identifiers: *Namib Desert.

The arthropod fauna of the sandy Namib Desert of SW Africa is rich and varid. Attempts were made to obtain comparative data about total water loss in a variety of species and to see whether and how this may be correlated with different habitats and different activity patterns. Seven beetle species and a thysamuran were investigated. The mean rate of weight loss in each species, at 27 deg C, decreased slightly over 5 days exposure. When the beetles were transfered to 90% relative humidity, a slight weight gain ensued the next day, followed by decreases the next 2 days which were lower than would have been expected in dry air. There was a significant correlation between weight and water loss, expressed as a percentage of original weight, on a log/log scale. No such correlation was obtained with the thysanuran. In general, the rates of total transpiration corresponded well with the ecological niches. The differential rates resulted, in part, from differences in size and in differences in rates of loss per unit surface area. The latter effect is probably due to differences in cuticular permeabilities. Dead beetles lose water faster than live animals. This seems to be due to loss of spiracular control. Ctenolapisma terebrans gained weight in relative humidities of 47.5% or more. This implies, but does not prove, the possibility of water uptake in unsaturated air. Such a mechanism would be a critically important adaptive trait in arid regions. (Casey-Arizona)
W72-00184

SEASONAL VARIATIONS IN THE FOOD OF JUVENILE HERRING IN COASTAL WATERS OF MAINE.
K. Sherman, and H. C. Perkins.
Trans Amer Fish Soc. 100 (1): 1971. 121-124.
Copyright 1971, Biological Abstracts, Inc.
Identifiers: Clupea-Harengus-Harengus, Coastal, Food, Herring, Juvenile, Maine, Seasonal, USA, Variations, Waters.
W72-00523

OCCURRENCE OF JUVENILE SNOOK CENTROPOMUS-UNDECIMALIS IN NORTH--CAROLINA WATERS,
J. R. Martin, and R. L. Shipp.
Trans Amer Fish Soc. 100 (1): 1971. 131-132.
Copyright 1971, Biological Abstracts, Inc.
Identifiers: Centropomus-Undecimalis, Economic, Juvenile, North-Carolina, Snook, Species, Stocking, USA, Waters.
W72-00526

SEPARATION OF TAXONOMICALLY IDENTIFIABLE ORGANISMS AND DETRITUS TAKEN FROM SHAD FOREGUT CONTENTS USING DENSITY GRADIENT CENTRIFUGATION, 1970, PROSOBRANCHIA MURICIDAE,
C. D. Baker, D. W. Martin, and E. H. Schmitz.
Trans Amer Fish Soc. 100 (1): 1971. 138-139.
Copyright 1971, Biological Abstracts, Inc.
Identifiers: Centrifugation, Density, Detritus, Dorosoma-Cepedianum, Dorosoma-Petense, Foregut, Gradient, Identifiable, Organisms, Separation, Shad, Taxonomically.
W72-00529

VETERINARY MEDICINE IN THE CONSERVATION AND MANAGEMENT OF MARINE MAMMAL RESOURCES,
J. R. Geraci, and M. C. Keyes.
J Amer Vet Med Ass. 157 (11): 1970. 1970-1974.
Copyright 1971, Biological Abstracts, Inc.
Identifiers: Carnivora, Cetacea, Conservation, Endangered, Food, Hunting, Mammal, Mammals, Management, Marine, Medicine, Pinnipedia, Resources, Sirenia, Veterinary, Whaling.
W72-00539

INFLUENCE OF HIGH TEMPERATURES ON THE WATER REGIME AND VIABILITY OF BLACK LOCUST-D ROBINIA-PSEUDOACACIA-D SEEDS,
D. Velkov.
Bialobok, Stefan and Boleslaw Suszka (Edited by). Proceedings of the International Symposium on Seed Physiology of Woody Plants. 187 p. Illus. Panstwowe Wydawnictowo Naukowe: Warsaw, Poland. ES, Vol. xxxvi.) 520 p. Illus. Verlag Chemie, 1970. 111-119.
Copyright 1971, Biological Abstracts, Inc.
Identifiers: Black, Dehydration, Gradual, High, Locust-D, Regime, Robinia-Pseudoacacia-D, Seeds, Temperatures, Viability, Water.
W72-00540

DOUBLE DORMANCY AND GERMINATION ON THE EXAMPLE OF TILIA-D AND CARPINUS-D SEEDS,
G. Vincent.
Bialobok, Stefan and Boleslaw Suszka (Edited by). Proceedings of the International Symposium on Seed Physiology of Woody Plants. 187 p Illus Panstwowe Wydawnictwo Naukowe: Warsaw, Poland. ES, Vol xxxvi.) 520 p Illus Verlag Chemie, 1970. 121-126.
Copyright 1971, Biological Abstracts, Inc.
Identifiers: Carpinus-D, Dormancy, Double, Germination, Humidity, Moisture, Seeds, Stratification, Tilia-Americana-D, Tilia-Cordata-D, Tilia-D, Tilia-Platyphyllos-D, Warm.
W72-00541

COMPARATIVE FATTY-ACID CHANGES DURING THE RAPID GROWTH OF TROUT IN SALT WATER PONDS,
J. B. Saddler, and P. R. Dorn.
Amer Zool. 10 (4): 1970. 514.
Copyright 1971, Biological Abstracts, Inc.
Identifiers: Comparative, Fatty-Acid, Growth, Ponds, Salt, Trout, Water.
W72-00557

WATER AND ELECTROLYTE BUDGETS IN A FIELD POPULATION OF THE DESERT LIZARD SAUROMALUS-OBESUS,
K. A. Nagy.
Amer Zool. 10 (4): 1970. 517.
Copyright 1971, Biological Abstracts, Inc.
Identifiers: Behavior, Bladder, Blood, Body, Budgets, Desert, Diet, Electrolyte, Extracellular, Field, Fluid, Lizard, Plant, Population, Sauromalus-Obesus, Urinary, Volume, Water.
W72-00559

WATER TURNOVER IN THE MOHAVE SAND LIZARD UMASCOPARIA,
J. E. Minnich, and V. H. Shoemaker.
Amer Zool. 10 (4): 1970. 517.
Copyright 1971, Biological Abstracts, Inc.
Identifiers: Diet, Insect, Lizard, Metabolic, Mohave, Plant, Rate, Sand, Tritiated, Turnover, Uma-Scoparia, Water.
W72-00560

SALT AND WATER BALANCE IN STONEFLY NAIADS PTERONARCYS-CALIFORNICA PLECOPTERA,
C. Colby.
Amer Zool. 10 (4): 1970. 517-518.
Copyright 1971, Biological Abstracts, Inc.
Identifiers: Balance, Hemolymph, Naiads, Plecoptera, Pteronarcys-Californica, Salt, Stonefly, Urine, Water.
W72-00561

FREE AMINO-ACID AND ELECTROLYTE ADJUSTMENTS IN THE SIPUNCULID WORM THEMISTE-DYSCRITUM DURING SALINITY STRESS,
R. C. Foster.
Amer Zool. 10 (4): 1970. 518.
Copyright 1971, Biological Abstracts, Inc.
Identifiers: Adjustments, Amino-acid, Coelomic, Electrolyte, Equilibrium, Fluid, Osmotic, Salinity, Sipunculid, Stress, Themiste-Dyscritum, Worm.
W72-00562

WATER PUMPING ACTIVITY IN FIELD POPULATIONS OF MARINE DEMOSPONGIAE,
H. M. Reiswig.
Amer Zool. 10 (4): 1970. 540.
Copyright 1971, Biological Abstracts.
Identifiers: Circadian, Cycle, Demospongiae, Field, Marine, Mycale, Populations, Pumping, Tethya-Crypta, Verongia-Gigantea, Water.
W72-00564

THE DISTRIBUTION AND ABUNDANCE OF THE INTER TIDAL PROSOBRANCHS LITTORINA-SCUTULATA AND LITTORINA-SITKANA,
S. Behrens.
Amer Zool. 10 (4): 1970. 540.
Copyright 1971, Biological Abstracts, Inc.
Identifiers: Abundance, British-Columbia, Canada, Density, Distribution, Evolution, Food, History, Inter, Life, Littorina-Scutulata, Littorina-Sitkana, Prosobranchs, Tidal.
W72-00565

PRELIMINARY BIOLOGICAL RECONNAISSANCE OF AQUATIC HABITATS, CUMBERLAND PENINSULA, BAFFIN ISLAND,
J. H. Bushnell.
Amer Zool. 10 (4): 1970. 543.
Copyright 1971, Biological Abstracts, Inc.
Identifiers: Acarina, Aquatic, Baffin, Biological, Canada, Crustacea, Cumberland, Ecology, Habitats, Island, Lakes, Marine, Moss, Oligochaeta, Paleo, Peninsula, Ponds, Reconnaissance, Rotifera, Strata.
W72-00568

FURTHER STUDIES ON THE VERTICAL DISTRIBUTION OF FRESH WATER PLANARIANS IN THE JAPANESE ISLANDS,
M. Kawakatsu.
Amer Zool. 10 (4): 1970. 546.
Copyright 1971, Biological Abstracts, Inc.
Identifiers: Distribution, Dugesia-Japonica, Ecology, Fresh, Islands, Japanese, Phagocata-Vivida, Planarians, Polycelis-Ariculata, Polycelis-Sapporo, Polycelis-Schmidti, Vertical, Water.
W72-00570

2J. Erosion and Sedimentation

THE BRISTOL FALL COLUMN FOR COARSE SEDIMENT GRADING,
Bristol Univ. (England). Dept. of Geology.
R. D. Channon.
Journal of Sedimentary Petrology, Vol 41, No 3, p 867-870, September 1971. 5 fig, 7 ref.

Descriptors: *Settling velocity, *Sedimentation, *Instrumentation, Sedimentation rates, Particle size, Particle shape, Deposition (Sediments).
Identifiers: Settling columns (Sedimentology).

The Bristol Fall Column was constructed to analyze current transported sediments from 42 microns to 8 mm size. This is possible because a large sample is used (at least 50 gms) which is sedimented in a full tube of 18 inches diameter. Other original features include a new sediment release mechanism. The importance of expressing results in terms of fall velocity is emphasized, and velocities determined for large samples in the new Column are compared with earlier single-sphere results. (Knapp-USGS)
W72-00057

DESIGN AND OPERATION OF A TRIAXIAL, HIGH-TEMPERATURE, HIGH-PRESSURE COMPACTION APPARATUS,
University of SOUTHERN California, Los Angeles. Dept. of Petroleum Engineering.
C. T. Sawabini, G. V. Chilingar, and D. R. Allen.
Journal of Sedimentary Petrology, Vol 41, No 3, p 871-881, September 1971. 7 fig, 1 tab, 25 ref.

Descriptors: *Compaction, *Instrumentation, *Clays, *Diagenesis, Pressure, Temperature, Laboratory tests, Sands, Cores, Sampling, Compressibility, Mineralogy, Porosity.

A compaction apparatus used at the University of Southern California's Petroleum Engineering Laboratories is described. The triaxial loading pressure is changed by varying the liquid pressure of a non-petroleum hydraulic oil around a rubber-sleeved cylindrical core sample. Core samples 1-7/8 inches in diameter and 2 to 3 inches long can be compacted. The pore pressure of the interstitial fluids is measured by means of a pressure bellows. The pressure vessel and the associated parts are housed inside an electric oven. The loading pressure can be varied from atmospheric to 40,000 psig, whereas the temperature can be changed from room temperature to 212 deg F. Sample calculations for determining the compressibility and void ratio of a poorly consolidated sand core are presented. (Knapp-USGS)
W72-00058

PRECISE SEDIMENT DENSITY DETERMINATION BY GAMMA-RAY ATTENUATION ALONE,
National Inst. of Oceanography, Wormely (England).

R. B. Whitmarsh.
Journal of Sedimentary Petrology, Vol 41, No 3, p 882-883, September 1971. 1 fig, 1 tab, 4 ref.

Descriptors: *Density, *Sediments, *Instrumentation, *Calibrations, *Nuclear moisture meters, Gamma rays, Hydrogen, Porosity.

A difficulty arises in using the gamma-ray attenuation method to calculate the density of water-saturated high porosity sediments because the Compton mass attenuation coefficient of water differs significantly from that of common sediment forming minerals. A method is proposed to overcome this problem by a series of successive approximations to the true sediment density. Densities derived by the iteration method were averaged over 1.5 m lengths of core and compared with densities calculated directly from the weights of the 1.5 m lengths of core in plastic liners, assuming a constant volume of core and plastic liner. The least squares line fitted to 208 such comparisons never deviates by more than 0.03 gm/cc from the expected line over the range of measured densities. (Knapp-USGS)
W72-00059

STUDY OF THE GEOMETRY OF SAND DUNES AND ESTIMATION OF BOTTOM SEDIMENT DISCHARGE (ISSLEDOVANIYE GEOMETRICHESKIKH KHARAKTERISTIK PESCHANYKH GRYAD I OTSENKA RASKHODA DONNYKH NANOSOV),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
Yu. M. Korchokha.
In: Eksperimental'nyye gidrologicheskiye issledovaniya na Valdaye; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 181, p 138-150, 1970. 3 fig, 3 tab, 17 ref.

Descriptors: *Dunes, *Bed load, *Bottom sediments, *Sediment discharge, *Sediment transport, Sediment distribution, Sediments, Suspended load, Suspension, Particle size, Hydraulic properties, Channel flow, Flow rates.
Identifiers: *USSR, Polomet' River, Dune dimensions, Dune movement, Flow velocity, Stream depth.

The length and steepness of sand dunes in the Polomet' River were examined to develop working formulas for defining dune dimensions as a function of hydraulic stream parameters and to establish procedures for determining bed load discharge on the basis of these characteristics. A direct relationship was found to exist between dune length and stream depth, which varied between 0.5 and 2.5 m. The relation of dune steepness to stream velocity and sediment diameter was more complex. A formula derived for calculating bed load discharge was based on observations on April 21, 1966 in an experimental reach of the Polomet' River near Yazhelbitsa. The total discharge of bed load at this time was 6.5 kg/sec, which was 15% of the suspended-sediment discharge value of 42 kg/sec. (See also W72-00061) (Josefson-USGS)
W72-00069

GIBBSITE IN COASTAL PLAIN SOILS, SOUTHEASTERN UNITED STATES,
Alabama Geological Survey, University.
For primary bibliographic entry see Field 02G.
W72-00090

STABILITY OF COASTAL PLAIN SURFACES,
Soil Conservation Service, Raleigh, N.C.
R. B. Daniels, E. E. Gamble, and W. H. Wheeler.
Southeastern Geology, Vol 13, No 2, p 61-75, September 1971. 3 fig, 1 tab, 46 ref.

Descriptors: *Geomorphology, *Coastal plains, *Atlantic coastal plain, *Erosion, Climates, Stratigraphy, Topography, Forests, Vegetation effects, Coasts, Drainage patterns (Geologic), North Carolina.
Identifiers: Coastal geomorphology.

Stratigraphic, geomorphic, paleobotanical and climatic evidence show that the drainage divides in most of the middle and part of the upper Coastal Plain have not been eroded since the surficial sediments were deposited. These lines of evidence include parallelism between the base of the surficial sediment and the divide surface, the common occurrence of an upper fine-grained sediment grading down to a coarser-grained sediment near the base, a regional slope of only two to four feet per mile, and the absence of an integrated drainage net on broad flats. Some of these drainage divides may have been stable for nearly 10 million years. This is a long time for a geomorphic surface to escape erosion, especially one so near a coast that has had several transgressions and regressions of the strand line. Extrapolation of erosion experiment data from the Piedmont to the Coastal Plain indicates that under a normal vegetative cover there should be essentially no erosion in the Coastal Plain on slopes of 2 to 4 feet per mile. If these surfaces had been bare, which is unlikely, raindrop impact and runoff could have removed material.
W72-00091

ORGANIC CARBON IN SEDIMENTS OF THE NORTH CAROLINA CONTINENTAL RISE,
Duke Univ., Durham. Marine Lab.
P. Froelich, B. Golden, and O. H. Pilkey.
Southeastern geology, Vol 13, No 2, p 91-97, September 1971. 3 fig, 18 ref.

Descriptors: *Organic matter, *Bottom sediments, *Continental slope, *North Carolina, Sampling, Cores, Water chemistry, Sedimentation, Distribution patterns, Carbon, Oxidation, Oxidation-reduction potential, Currents (Water), Ocean currents, Sediment transport.
Identifiers: *Continental rise.

The organic carbon content of 208 samples from 18 piston cores on the North Carolina continental rise was investigated. Length of time of exposure of the sediment to oxidizing conditions appears to be the single most important factor causing variation of organic carbon content within single cores and between different portions of the continental rise. Exposure time appears to be a function of sedimentation rate and the importance of the contour-current contributions. (Knapp-USGS)
W72-00092

INTRODUCTION TO FLUVIAL PROCESSES.

Methuen, London, 1971. 218 p.

Descriptors: *Erosion, *Sedimentation, *Geomorphology, Weathering, Soil moisture, Infiltration, Throughfall, Overland flow, Groudwater, Karst, Open channel flow, Hydraulics, Stage-discharge relations, Glaciers, Snowpacks, Glacial drift, Runoff, Climatology.
Identifiers: *Geography.

The theme of this book is that the study of water provides a logical link between an understanding of physical and social environments. Each chapter develops this theme by proceeding from the many aspects of water occurrence to a deeper understanding of natural environments and their fusion with the activities of man in society. In this way water is viewed as a highly variable and mobile resource in the widest sense. Not only is it a commodity which is directly used by man but it is often the mainspring for extensive economic development, commonly an essential element in man's aesthetic environment which provides the stage for his activities. The subjects discussed include: World erosion and sedimentation; the drainage basin as the fundamental geomorphic unit; the role of water in rock disintegration; soil moisture; infiltration, throughflow, and overland flow; erosion by water on hillslopes; the geomorphic effects of groundwater; open channel flow; hydraulic geometry; the geomorphology and morphometry of glacial and nival areas; periglacial morphometry; relation of morphometry to runoff frequency; climatic geomorphology; and geomorphic implications of climatic changes. (See also W72-00101 thru W72-00114) (Knapp-USGS)
W72-00100

WORLD EROSION AND SEDIMENTATION,
Cambridge Univ. (England). Dept. of Geography.
D. R. Stoddart.
In: Introduction to Fluvial Processes, Methuen, London, p 8-29, 1971. 9 fig, 9 tab, 24 ref.

Descriptors: *Erosion, *Sedimentation, *Earth (Planet), *Sediment transport, *Sediment yield, Reviews, Alluvium, Streams, Rivers, Oceans, Sediment load, Suspended load.
Identifiers: *Fluvial processes.

The magnitudes and areal variations of both erosion and sedimentation on a world scale are reviewed. Gross rates of denudation of the land surface are given by measuring the sediment load of rivers at their mouths. Compilation of data from rivers throughout the world can be used to identify patterns of present denudation, especially when reduced to some common unit, such as meters per thousand years. Because of the multivariate controls of rate of erosion, including relief, lithology, climate, and human use, these studies can yield only a first-order approximation. Perhaps the most remarkable fact about sedimentation in the oceans is, over vast areas, its extreme slowness, and the concentration of most sediment into a few depositional basins. However, if present rates of 0.001-0.01 meters per thousand yrs are extrapolated into the past, assuming the ocean basins to be 20 billion yrs old, sediment thicknesses should be 1-10 km, nearer the latter than the former. Seismic work in the deep oceans has shown that the mean depth of unconsolidated material on the floors is about 0.5 km in the Pacific, 0.1-3 km in the Arctic, 0.6 km in the Indian Ocean, and 0.3-0.6 km in the Atlantic (down to zero on the mid-ocean ridge). (See also W72-00100) (Woodard-USGS)
W72-00101

THE DRAINAGE BASIN AS THE FUNDAMENTAL GEOMORPHIC UNIT,
Cambridge Univ. (England). Dept. of Geography.
R. J. Chorley.
In: Introduction to Fluvial Processes, Methuen, London, p 30-52, 1971. 21 fig, 22 ref.

Descriptors: *Geomorphology, *Land forming, *River basins, *Erosion, *Reviews, Streamflow, Topography, Geology, Hydrogeology, Surface runoff, Sedimentation.
Identifiers: *Fluvial processes.

The need for the precise description of the geometry of landforms, particularly those of dominantly fluvial erosive origin is discussed in determining drainage basin geomorphology. The linear aspects of stream networks are analyzed from two main viewpoints: (a) the topological, which considers the interconnections of the system and yields some scheme of stream ordering; and (b) the geometrical, having to do with the lengths, shapes, and orientations of the constituent parts of the network. Basin area is hydrologically important because it directly affects the size of the storm hydrograph and the magnitudes of peak and mean runoff. Longitudinal profiles of stream channels are characteristically concave-up, and it has been suggested that this is due to the increase of discharge downstream not being balanced by any commensurate increase in frictional losses. Similarities between the bifurcation, length, and area ratios of basins of differing size developed on bedrock lacking pronounced structural control indicate that erosional drainage basins in differing hydrological environments may show a close approximation to geometrical similarity when mean values are considered. (See also W72-00100) (Woodard-USGS)
W72-00102

THE ROLE OF WATER IN ROCK DISINTEGRATION,
Cambridge Univ. (England). Dept. of Geography.

R. J. Chorley.
In: Introduction to Fluvial Processes, Methuen, London, p 53-73, 1971. 11 fig, 1 tab.

Descriptors: *Erosion, *Rocks, *Weathering, *Water types, *Sedimentation, Acidic water, Alkaline water, Rainfall, Surface runoff, Water chemistry, Rock properties, Water properties, Igneous rocks, Sedimentary rocks, Thermal water, Chemical properties, Chemical reactions, Hydrolysis, Oxidation.
Identifiers: *Fluvial processes.

Chemical reactions associated with the disintegration of various rock types in waters of various chemical properties are described. The dominant primary weathering process of igneous rocks is hydrolysis, whereas solution, oxidation, and hydration are more important in most sedimentary rock decomposition. Metamorphic rocks are generally very susceptible to chemical weathering in the presence of water because the usual effects of metamorphism are to produce secondary high-temperature minerals of low stability, together with banding and schistosity, which encourages the entry of surface water. One major exception is recrystallized orthoquartzite. The breakdown of minerals forming igneous rocks leads to the production and isolation of stable minerals, like clay and silica debris, as well as cations, largely of calcium. After the clastic debris is washed away by rivers the clay fraction of it is commonly separated from the coarser material, usually in a marine environment, to form beds which may be lithified to form shale. The composition of the shale is largely dependent on the types of clay minerals involved and partly on the environment of deposition. (See also W72-00100) (Woodard-USGS)
W72-00103

SOIL MOISTURE,
McGill Univ., Montreal (Quebec). Dept. of Geography.
For primary bibliographic entry see Field 02G.
W72-00104

INFILTRATION, THROUGHFLOW, AND OVERLAND FLOW,
Bristol Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 02G.
W72-00105

EROSION BY WATER ON HILLSLOPES,
Bristol Univ. (England). Dept. of Geography.
M. J. Kirkby.
In: Introduction to Fluvial Processes, Methuen, London, p 98-107, 1971. 4 fig, 1 tab, 17 ref.

Descriptors: *Soil erosion, *Sediment transport, *Slopes, *Rainfall, *Gully erosion, Channel flow, Land forming, Erosion control, Vegetation, Topography, Soil properties, Agriculture, Cultivation, Furrows.
Identifiers: *Fluvial processes, *Hillslope erosion.

Water flowing in clearly-defined channels is the primary cause of hillslope fluvial erosion processes. The positions of channel heads, which control the drainage texture, vary areally between basins and fluctuate through time within a basin. At any moment their positions depend on the incidence of major storms which are extremely local in their effect; but the average positions of channel heads over a period of time are controlled mainly by soil, slope gradient, precipitation, and vegetation cover. Man can interrupt the natural balance by his control of vegetation and, to a lesser extent, by tillage, and most agriculture would lead to gullying if no preventive measures were taken. However, the extent to which conservation measures are necessary varies widely, according to the extent to which overland flow is increased by cultivation. (See also W72-00100) (Woodard-USGS)
W72-00106

THE GEOMORPHIC EFFECTS OF GROUNDWATER,
Trinity Coll., Dublin (Ireland). Dept. of Geography.
For primary bibliographic entry see Field 02F.
W72-00107

OPEN CHANNEL FLOW,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 08B.
W72-00108

HYDRAULIC GEOMETRY,
Sydney Univ. (Australia). Dept. of Geography.
For primary bibliographic entry see Field 08B.
W72-00109

THE GEOMORPHOLOGY AND MORPHOMETRY OF GLACIAL AND NIVAL AREAS,
Durham Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 02C.
W72-00110

PERIGLACIAL MORPHOMETRY,
Cambridge Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 02C.
W72-00111

RELATION OF MORPHOMETRY TO RUNOFF FREQUENCY,
Sydney Univ. (Australia). Dept. of Geography.
For primary bibliographic entry see Field 02E.
W72-00112

CLIMATIC GEOMORPHOLOGY,
Cambridge Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 02E.
W72-00113

GEOMORPHIC IMPLICATIONS OF CLIMATIC CHANGES,
Colorado State Univ., Fort Collins. Dept. of Geology.
For primary bibliographic entry see Field 02E.
W72-00114

STREAMFLOW, SEDIMENT-TRANSPORT, AND WATER-TEMPERATURE CHARACTERISTICS OF THREE SMALL WATERSHEDS IN THE ALSEA RIVER BASIN, OREGON,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02E.
W72-00115

EXPERIMENTAL STUDY OF CHANNEL PATTERNS,
Colorado State Univ., Fort Collins. Dept. of Geology.
For primary bibliographic entry see Field 02E.
W72-00119

CLARIFICATION OF TURBID WATER BY FILTER FABRICS,
Corps of Engineers, Omaha, Nebr.
For primary bibliographic entry see Field 05G.
W72-00120

SAND WAVES ON BROWNS BANK OBSERVED FROM THE SHELF DIVER,
Bedford Inst., Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
G. Drapeau.
Maritime Sediments, Vol 6, No 3, p 90-101, December 1970. 15 fig, 3 tab, 13 ref.

Descriptors: *Sand waves, *Ripple marks, *Bottom sediments, *Continental shelf, *Sediment transport, Sampling, Surveys, Waves (Water), Underwater, Submarines, Currents (Water), Ocean currents.
Identifiers: *Canada, *Scotian Shelf.

The submersible 'Shelf Diver' was used in August 1969 to investigate the sedimentary processes prevailing on the Scotian Shelf. Browns Bank was the most interesting among the four areas investigated. The mechanisms responsible for the formation of sand waves on Browns Bank are similar to those observed on Georges Bank and on banks in the vicinity of the British Isles. The tidal currents have the same intensity, and 16 percent of the time, the waves are strong enough to induce oscillatory currents of 20 cm/sec or more on the bottom. (Knapp-USGS)
W72-00130

SEDIMENTOLOGICAL SAMPLING AND RESULTS FROM THE DIVER LOCK-OUT FACILITY OF THE SUBMERSIBLE SHELF DIVER, BAY OF FUNDY, NOVA SCOTIA,
Bedford Inst., Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
For primary bibliographic entry see Field 02L.
W72-00131

SHORELINE ORIENTATION AND STORM SURGE,
Massachusetts Univ., Amherst. Dept. of Geology.
C. H. Hobbs, III.
Maritime Sediments, Vol 6, No 3, p 113-115, December 1970. 4 fig, 6 ref.

Descriptors: *Surges, *Hurricanes, *Storms, *Waves (Water), *Wind tides, Tides, Coasts, Wind velocity, Tidal effects, Winds, Seiches.
Identifiers: *Storm surges.

The storm surge is the deviation of the observed storm tide from the expected astronomical tide. The orientation of the shore with respect to the storm path is critical in determining the magnitude of the surge. A coast that faces perpendicularly into the storm track is subjected to a reinforced wind and wave set-up. Due to the counterclockwise rotation of the winds about the storm center, only parallel to the storm track and to the right of the storm center do the winds blow along a constant path. This reinforcement is analogous to the Doppler Effect noted in other types of wave energy. A storm which moves quite rapidly does not have time to reinforce itself as greatly as does a slow-moving or stationary storm. The duration of the reinforcing winds parallel to the storm track is not as great for the rapidly moving storm hence the wind and wave setups are not able to develop to their greatest extent. The greatest storm surge should occur slightly to the right of the point where the center of a slowly moving storm crosses a coast that is perpendicular to the storm track. (Knapp-USGS)
W72-00132

BEACH PROCESSES AND SHORELINE CHANGES, KOUCHIBOUGUAC BAY, NEW BRUNSWICK,
McMaster Univ., Hamilton (Ontario).
For primary bibliographic entry see Field 02L.
W72-00133

EXOTIC PEBBLES IN QUATERNARY DEPOSITS FROM THE SOUTH COAST OF THE ST. LAWRENCE ESTUARY, QUEBEC,
Department of Fisheries and Forestry, Sainte Foy (Quebec).
For primary bibliographic entry see Field 02L.
W72-00134

THE GEOMORPHOLOGY OF CENTRAL AUSTRALIA, (GEOMORPHOLOGIE VON ZENTRALAUSTRALIEN NACH H. BREMER),
Wuerzburg Univ. (West Germany). Geographisches Institut.
J. Budel.
Zeitschrift fur Geomorphologie, Vol 13, No 2, p 217-230, 1969. 1 ref.

Descriptors: *Semiarid climates, *Geomorphology, *Land forming, *Erosion, *Tropical regions, Valleys, Topography, Mountains, River systems, History, Geologic formations, Dunes, Rocks, Rainfall, Soil types, Landforms, Deserts, Flood plains.
Identifiers: *Central Australia.

An attempt is made to establish a differentiation between various relief features of Central Australia, and to document the differences between conditions prevailing today and those inherited from the past. The special climatic history of the area is considered and comparisons are made with other tropic and semitropic arid lands. The study area was a region of low lying sand dunes encircled by mountain ranges and topographic depressions. An intensive analysis was made of major and minor rock formations, genetic soil factors, valley erosion, types and distribution of dune fields and river and flood effects. Both Tertiary and Pleistocene developments are discussed. Flat areas are extremely old, and their present day formation is continuing through denudation processes. Such processes are also currently responsible for the formation of isolated mountains. These cliffs or mountains are surprisingly stable as compared to similar formations in non-tropical areas. The flat valleys through the mountains, which often create isolated mountain chains, are not the result of river-cutting, but rather of shifting intermontanic plateaus. The few rivers only cut into those already existing valleys. It is concluded that, in contrast to non-tropical areas, valley erosion operates in tropical areas without the help of rivers. (Casey-Arizona)
W72-00170

THE QUATERNARY DELTAIC AND CHANNEL SYSTEM IN THE CENTRAL GREAT VALLEY, CALIFORNIA,
California Univ., Davis. Dept. of Geography.
R. J. Shlemon.
Annals, Association of American Geographers, Vol 61, No 3, p 427-440, September 1971. 3 fig, 1 tab, 42 ref.

Descriptors: *California, *Channel morphology, *Deltas, *Quaternary period, *Stratigraphy, *Sea level, Deposition (Sediments), River basins, Glaciation, Mountains, Pleistocene epoch, Geomorphology, Alluvial channels, Alluvium, Hydrogeology, Carbon radioisotopes, Subsurface drainage, Radioactive dating.
Identifiers: *Eustacy, *Thalassostatic sediments.

The Great Valley of California overlies the remnants of a once great, deep-channeled river system that carried sediments to a base well below present sea level. The old channel probably existed 3 or 4 times during the Pleistocene, each time slowly evolving into a drainage network similar to the present. In the central part of the Great Valley the Mokelumne River, a tributary of the lower San Joaquin, drains the glaciated Sierra Nevada Mountains, and finally debouches directly into the California Delta. Composed of an alternating sequence of glacial gravel-filled channels and overlying fan deposits, the river sediments merge directly into interglacial, deltaic deposits. Stratigraphic relationships show that at least 3 Mokelumne River gravel-filled channels extend in the subsurface from fluvial terraces westward to the California Delta. The channels were probably cut during glaciation onsets in the Sierra Nevada Mountains, and subsequently graded to eustatically lowered and possibly subsiding base levels. Thalassostatic sedimentation and headward expansion of the Delta occurred during interglacial times as a result of rising seas. Radiocarbon dating of basal deltaic peat indicates the Pleistocene-Holocene transition occurred here about 10,700 years ago. (Casey-Arizona)
W72-00177

A METHOD OF TRACING SEDIMENT MOVEMENT ON THE TEXAS GULF COAST,
Texas A and M Univ., College Station. Coastal and Ocean Engineering Div.
M. Ward, and R. M. Sorensen.
Available from NTIS, Springfield Va 22151 as PB 199195, - Price $3.00 paper copy; $0.95 microfiche. Texas A and M University Sea Grant Publication No TAMU-SG-71-204, December 1970. 111 p, 19 fig, 3 tab, 51 ref, 2 append. NSF Grant GH-101.

Descriptors: *Sediment transport, *Tracers, *Littoral drift, *Gulf of Mexico, *Texas, Marking techniques, Coatings, Tracking techniques.
Identifiers: *Acrylic lacquer, *Sediment coating.

Methods of coating sand with fluorescent material and a technique for recovering samples and analyzing fluorescent tracer movement were studied both in the field and in the laboratory. The primary objective was to develop a suitable and reliable method of tracing sediment movement on the Texas Gulf Coast. The best method of investigating the movement of sediment in the littoral drift was through the use of sediment coated with acrylic lacquer and resin. The long life characteristics of the acrylic coating make it possible to study sediment movement over long reaches. And, since acrylic paint can be obtained in a variety of colors, the movement of different sized fractions can be investigated. (Woodard-USGS)
W72-00314

NOTES ON SEDIMENTATION ACTIVITIES, CALENDER YEAR 1970.
Soil Conservation Service, Washington, D.C.

Water Resources Council, Sedimentation Committee Annual Report, 1971. 208 p, 2 append.

Descriptors: *Sedimentation, *Documentation, *Publications, *Reviews, *Bibliographies, Projects, Project planning, Analytical techniques, Data collections, Surveys, Sedimentology.
Identifiers: *Sedimentation activities (1971).

Information on sedimentations for the year 1971 is furnished by all Federal agencies conducting investigations on work in progress or planned, important findings, new methods, new publications, laboratory and other research activities, and other pertinent information. The material has been organized by major regions in the conterminous United States, Alaska, Hawaii, Puerto Rico, and Foreign. Other major headings include Laboratory and Other Research Activities. An excerpt from the Catalog of Information on Water Data, Index to Water Quality Stations, 1970 edition, compiled by the Geological Survey, Office of Water Data Coordination, is included. This excerpt is a list, as of October 1970, of long-term water quality sites at which sediment data have been collected. Also, a listing of agency addresses by departments where additional information on agency activities can be obtained is included. (Woodard-USGS)
W72-00318

OBSERVATIONS ON A COLLAPSING KAME TERRACE IN GLACIER BAY NATIONAL MONUMENT, SOUTH-EASTERN ALASKA,
Ohio State Univ., Columbus. Inst. of Polar Studies.
For primary bibliographic entry see Field 02C.
W72-00332

2K. Chemical Processes

GAS ABSORPTION IN A HETEROGENEOUS SYSTEM,
Iowa State Univ., of Science and Technology, Ames. Engineering Research Inst.
For primary bibliographic entry see Field 05A.
W72-00085

METHODS FOR CHEMICAL ANALYSIS OF WATERS AND WASTEWATERS,
Department of Fisheries and Forestry, Ottawa (Ontario). Inland Waters Branch.
W. J. Traversy.
Canada Department of Fisheries and Forestry Inland Waters Branch, Water Quality Division Report, 1971. 169 p, 18 fig.

Descriptors: *Water analysis, *Analytical techniques, *Test procedures, *Methodology, Chemical analysis, Laboratory tests, Water chemistry.
Identifiers: *Water analysis manual, *Canada.

Analytical procedures are described for analyzing 55 water parameters. These methods are used in the Water Quality Division laboratories in Ottawa and Burlington, Ontario; Calgary, Alberta; and Moncton, N.B. The manual was prepared as a joint project of the two Sections of the Water Chemistry Subdivision: the Methods and Properties Section, which is for research and development work on analytical methodology; and the Analytical Services Section, which ensures that methods developed can be used on a regular basis in analytical services laboratories handling large volumes of samples. (Woodard-USGS)
W72-00086

THE CHEMICAL STATES OF COPPER IN POLLUTED FRESH WATER AND A SCHEME OF ANALYSIS TO DIFFERENTIATE THEM,
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 05B.
W72-00126

CHEMISTRY OF NATURAL WATERS - III CARBONIC ACID,
National Inst. for Water Research, Congella (South Africa) Regional Lab.
For primary bibliographic entry see Field 05A.
W72-00127

ACIDITY CONTROL IN BALD EAGLE CREEK AND WEST BRANCH SUSQUEHANNA RIVER, CLINTON COUNTY, PENNSYLVANIA.
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 05B.
W72-00128

CHEMICAL AND BIOLOGICAL CONDITIONS IN BALD EAGLE CREEK AND PROGNOSIS OF TROPHIC CHARACTERISTICS OF FOSTER JOSEPH SAYERS RESERVOIR, CENTRE COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, Pa., Water Resources Div.
For primary bibliographic entry see Field 05C.
W72-00129

WATER STRUCTURE AS A DETERMINANT OF ION DISTRIBUTION IN LIVING TISSUE,
Auckland Univ. (New Zealand). Dept. of Medicine.
For primary bibliographic entry see Field 01B.
W72-00207

EFFECT OF HUMIC ACIDS ON IRON ANALYSES IN NATURAL WATERS,
South Florida Univ., Tampa. Dept. of Chemistry.
M. T. Doig, III, and D. F. Martin.
Water Research, Vol 5, No 9, p 689-692, September 1971. 1 fig, 1 tab, 10 ref.

Descriptors: *Water chemistry, *Natural streams, *Humic acids, *Iron, *Florida, Chemical analysis, Analytical techniques, Microscopy, Chemical reactions, Solubility.
Identifiers: *Iron solubility, Microanalysis.

Florida river samples containing high and low concentrations of humic acids, naturally occurring chelators, were analyzed for iron content. The samples were subjected to automated microanalysis of soluble iron. Through statistical analyses of many replicate samples, it was possible to evaluate the error of analysis of low and high concentrations of iron in waters containing low and high concentrations of humic acid. Statistical evidence is presented to show that the presence of humic acid does not interfere in the precision of analysis of soluble iron and that changes in the iron content can be detected after storage for 2 months at - 10 deg C. (Woodard-USGS)
W72-00315

2L. Estuaries

GIBBSITE IN COASTAL PLAIN SOILS, SOUTHEASTERN UNITED STATES,
Alabama Geological Survey, University.
For primary bibliographic entry see Field 02G.
W72-00090

STABILITY OF COASTAL PLAIN SURFACES,
Soil Conservation Service, Raleigh, N.C.
For primary bibliographic entry see Field 02J.
W72-00091

ORGANIC CARBON IN SEDIMENTS OF THE NORTH CAROLINA CONTINENTAL RISE,
Duke Univ., Durham. Marine Lab.
For primary bibliographic entry see Field 02J.
W72-00092

IMPROVED DISCRETE DEPTH SAMPLER,
Naval Underwater Systems Center, Newport, R.I. Ocean Science Dept.
For primary bibliographic entry see Field 07B.
W72-00093

RESIDUES IN FISH, WILDLIFE, AND ESTUARIES,
National Marine Fisheries Service, Auke Bay, Alaska. Biological Lab.
For primary bibliographic entry see Field 05B.
W72-00122

SAND WAVES ON BROWNS BANK OBSERVED FROM THE SHELF DIVER,
Bedford Inst., Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
For primary bibliographic entry see Field 02J.
W72-00130

SEDIMENTOLOGICAL SAMPLING AND RESULTS FROM THE DIVER LOCK-OUT FACILITY OF THE SUBMERSIBLE SHELF DIVER, BAY OF FUNDY, NOVA SCOTIA,
Bedford Inst., Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
B. R. Pelletier.
Maritime Sediments, Vol 6, No 3, p 102-109, December 1970. 8 fig, 15 ref.

Descriptors: *Sampling, *Bottom sediments, *Submarines, *Bays, Statistics, Statistical methods, Sedimentation, Sediment transport, Particle size, Distribution patterns, Stratigraphy, Currents (Water), Tides.
Identifiers: *Bay of Fundy.

Dives were made to 800-foot depth in the Bay of Fundy in order to make observations on suspected areas of bedrock occurrences, to observe certain dynamic processes and features of marine sedimentation, and to sample and photograph a variety of sedimentary and benthic environments on a closely controlled survey plan. Three shallow-water sites were selected, and a statistically small representation (16 samples) was obtained from each. The sediments were analyzed mechanically to determine their granulometric characteristics, and the results were treated statistically by means of moment measures. Kurtosis varied inversely with standard deviation, and the larger values of kurtosis varied directly with the coarseness of the sedimentary texture. Factors such as the availability of mechanical energy, amount and size of available material in the source area, geographic and physiographic location of the depositional site, and possibly characteristics of the grade scale itself were examined and evaluated. (Knapp-USGS)
W72-00131

BEACH PROCESSES AND SHORELINE CHANGES, KOUCHIBOUGUAC BAY, NEW BRUNSWICK,
McMaster Univ., Hamilton (Ontario).
S. B. McCann, and E. A. Bryant.
Maritime Sediments, Vol 6, No 3, p 116-117, December 1970. 2 fig, 2 ref.

Descriptors: *Beach erosion, *Surf, *Winds, Geomorphology, Waves (Water), Topography, Sand bars, Dunes, Beaches, Sedimentation.
Identifiers: New Brunswick (Canada).

Kouchibouguac Bay, New Brunswick, has a series of barrier islands with a limited fetch window to waves from the Gulf of St. Lawrence. These islands are sheltered by the New Brunswick mainland and Prince Edward Island from all wind directions except the north-northeast. Despite this limited exposure, the barrier islands have been undergoing considerable changes in configuration, as is evidenced by maps, made since the 1880's and by aerial photographs, taken since 1930. These changes are most evident around the inlets between the islands. The barrier islands are undergoing active erosion of the frontal dunes, and there is a general trend of decrease in dune height and increase in beach width northwards. The predominant wind direction which affects the wave regime of this area is north to northeast. This direction coincides with the maximum fetch for Kouchibouguac Bay and with maximum wind velocities. (Knapp-USGS)
W72-00133

EXOTIC PEBBLES IN QUATERNARY DEPOSITS FROM THE SOUTH COAST OF THE ST. LAWRENCE ESTUARY, QUEBEC,
Department of Fisheries and Forestry, Sainte Foy (Quebec).
J. C. Dionne.
Maritime Sediments, Vol, No 3, p 110-112, December 1971. 1 fig, 1 tab, 11 ref.

Descriptors: *Bottom sediments, *Sampling, *Sediment transport, *Provenance, *Ice, Estuaries, St. Lawrence River, Sedimentation, Pleistocene epoch, Rivers.
Identifiers: Ice-rafted sediments.

Crystalline pebbles from the Canadian Shield occur in the Quaternary deposits within the Applachian area of Riviere-du-Loup/Trois-Pistoles, on the south shore of the maritime St. Lawrence Estuary. Counts were made on 34,234 pebbles (2 to 6 cm in diameter), from 175 sites distributed as follows: 49 from modern beaches, 23 from post-glacial raised beaches, 14 from delta deposits, 27 from outwash, 20 from the St. Antonin moraine, 32 from ablation till, and 10 from submerged till. The pebbles come from the Canadian Shield located on the north shore of the St. Lawrence estuary, 25 to 40 km away. Pleistocene glaciers contributed only a small proportion of crystalline rocks (less than 2%). A very small proportion (less than 0.5%) can be related to transportation by organic agents, waves and currents, and to the erosion of the Cambro-Ordovician conglomerates which outcrop in the area. The main contribution was made by drift ice, an agent of transportation still in action along the shores of the St. Lawrence estuary. (Knapp-USGS)
W72-00134

CLEAN WATER FOR MISSISSIPPI'S ESTUARIES.
For primary bibliographic entry see Field 05G.
W72-00246

CONTROL OF ESTUARINE POLLUTION,
For primary bibliographic entry see Field 06E.
W72-00290

A METHOD OF TRACING SEDIMENT MOVEMENT ON THE TEXAS GULF COAST,
Texas A and M Univ., College Station. Coastal and Ocean Engineering Div.
For primary bibliographic entry see Field 02J.
W72-00314

OCEAN OUTFALL DESIGN: PART I - LITERATURE REVIEW AND THEORETICAL DEVELOPMENT,
Pacific Northwest Water Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 05B.
W72-00356

A RETURN TO THE COAST,
Center for the Environment and Man.
W. V. McGuinness, Jr.
Water Spectrum, Vol 3, No 3, p 24-28, Fall 1971. 5 photo.

Descriptors: *Coasts, *Planning, *Estuaries, *Environment.
Identifiers: *Coastal zone management, *Coastal resources, *Socio-economic values, Concepts, Planners.

Some of the dimensions of comprehensive coastal zone management and attitudes toward US coastal resources are discussed. The basic theme is one of a balance between environmental and socio-economic values. Problems of coastal zone management include the general problem of demand and supply, common to all resource management. The situation is complicated by conflicts between coastal users, between coastal and inland users, and governmental planners. Three broad concepts have developed as types of planning overviews on the problems of coastal zone management. (1) The use-oriented concept is basically optimistic, with a methodology derived from river basin planning. It states that we can discover ways of applying our growing knowledge to improve the human condition, while retaining the requirements of the natural system; (2) 'The carrying capacity of nature' is the main concern of this second concept. It forces greater emphasis on the quality of experience rather than upon the number of people that can capture the experience. Air and water quality planning is now based upon this approach; (3) The third concept involves the study of environmental processes and interrelationships of them into a comprehensive, computerized, physical-chemical-biological model of a coastal system. (Strachan-Chicago)
W72-00393

SOME ASPECTS OF THE HYDROGRAPHY OF A RELATIVELY UNPOLLUTED ESTUARY IN SOUTHEASTERN MASSACHUSETTS,
Southeastern Massachusetts Technological Inst. North Dartmouth.
For primary bibliographic entry see Field 05C.
W72-00431

SAN FRANCISCO BAY-DELTA WATER QUALITY CONTROL PROGRAM: FINAL REPORT.
California Water Resources Control Board, Sacramento.
For primary bibliographic entry see Field 05G.
W72-00454

03. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

STUDY OF UNCONVENTIONAL METHODS FOR BRINE CONCENTRATION,
Garrett Research and Development Co., La Verne, Calif.
R. F. Battey, R. N. Jacobson, and S. Foster.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $0.70. Office of Saline Water Research and Development Report No 641, April 1971. 69 p, 7 fig, 21 tab, 149 ref.

Descriptors: *Water yield, Demineralization, *Brine disposal, Brines, Waste water disposal, *Desalination plants, Membranes, Waste disposal, *Salt extraction.
Identifiers: *Solvent extraction, *Ion exchange desulfation.

Unconventional methods were studies for concentrating the waste effluents from membrane desalting plants at inland locations to facilitate their disposal. Two solvent extration methods and three processes involving ion exchange with production of chemical regenerants from the dissolved salts appear feasible. Preliminary flowsheets, material balances, and capital and operating cost estimates were prepared for these processes. Several of these should find application as primary desalting processes, with the unique feature that only very concentrated waste effluents are produced. (Mintz-Office of Saline Water)
W72-00379

3B. Water Yield Improvement

PERFORMANCE OF AN ATMOSPHERIC WATER RESOURCES RESEARCH PROGRAM IN THE HUNGRY HORSE AREA, MONTANA, 1969-70 SEASON.
North American Weather Consultants, Goleta, Calif.

Available from the National Technical Information Service as PB-198 659, $3.00 in paper copy, $0.95 in microfiche. Report no 6-108, Dec 15, 1970. 12 p. Bu Rec 14-06-D-6039.

Descriptors: *Cloud seeding, *Water supply, Stream flow, Precipitation, Meteorology, Snow.
Identifiers: *Montana, Condensation nuclei, Aerosol generators, Hungry Horse Basin, Hungry Horse Reservoir.

This report covers the fourth season of an operational adaptation research project in the Hungry Horse basin in western Montana. The third season operations report suggested that the streamflow evaluation technique was invalid due to seeding effects in the control streams with the use of valley generators. This report notes that the overriding factor making the streamflow evaluation technique invalid is the small fraction of the water year precipitation that has been seeded. Anticipated increases due to seeding would be undetectable using this technique. Previous estimates of seeding increases based upon snow course data are considered invalid due to the differing dates of obtaining the measurements with intervening precipitation, both during the seeded and historical years. The only appropriate way to evaluate the effects of seeding in the Hungry Horse area is by reference to short-period precipitation records, where randomization is conducted to some extent. The seeding suspension criterion should be reeevaluated to permit a longer seeding season, and higher elevation generators should be installed so that storms with a stable air mass, which are now considered unseedable with the valley generators, could be seeded.
W72-00375

3C. Use of Water of Impaired Quality

OSMOTIC WATER STRESS: MESOPHYLL SATURATION DEFICIT AND TRANSPIRATION RATES OF TAMARISK,
Minnesota Univ., St. Paul. School of Forestry.
For primary bibliographic entry see Field 02D.
W72-00172

THE FRESHWATER-SUPPLY PROBLEMS OF MANKIND,
Moscow State Univ. (USSR); and Akademiya Nauk SSSR, Moscow. Inst. of Water Research; and Akademiya Nauk SSSR, Moscow. Geologicheskii Institut; and Gosudarstvennyi Gidrologicheskii Institut, Moscow (USSR).
For primary bibliographic entry see Field 02A.
W72-00187

3D. Conservation in Domestic and Municipal Use

TECHNICAL, FINANCIAL, AND ADMINISTRATIVE ASPECTS OF WATER SUPPLY IN THE URBAN ENVIRONMENT IN THE AMERICAS,
For primary bibliographic entry see Field 06B.
W72-00406

3E. Conservation in Industry

STUDIES OF MUNICIPAL WASTEWATER RENOVATION FOR INDUSTRIAL WATER,
Bechtel Corp., San Francisco, Calif. Environmental Systems Group.
For primary bibliographic entry see Field 05D.
W72-00045

3F. Conservation in Agriculture

PRESSURE DISTRIBUTION ON A CENTER-PIVOT SPRINKLER IRRIGATION SYSTEM,
Department of Agriculture, Mitchell, Nebr., and Department of Agriculture, Fort Collins, Colo.
For primary bibliographic entry see Field 08B.
W72-00078

AN AUTOMATIC RUNOFF SAMPLER,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 07B.
W72-00118

RANGE ECOLOGY AT THE INSTITUTE,
Iraq Inst. for Applied Research on Natural Resources, Baghdad.
R. N. Kaul, and D. C. P. Thalen.
Nature and Resources, Vol 7, No 2, p 10-15, June 1971. 1 fig, 3 tab, 8 ref.

Descriptors: *Range management, *Arid lands, *Vegetation, *Reclamation, *Surveys, Resource development, Natural resources, Mapping, Topography, Grazing, Pasture management, Ecosystems, Environmental effects, Economic feasibility, Forage palatability.
Identifiers: *Iraq.

With assistance from the United Nations Development Program, Iraq, in 1967, transformed its Arid Zone Research Institute into an Institute for Applied Research on Natural Resources. The purpose of the new Institute is to survey the natural resources of the country in order to gain a better insight into the feasibility of development projects, to distinguish the limiting factors and to estimate the optimum return on investments in projects utilizing, for a major part, natural resources. Since the rangelands of the Southern and Western Deserts and the Jezira Desert play an important role in the country's economy through livestock production, the institute's ecology section started a range research programme. The purpose was to obtain an integrated knowledge of the nature and dynamics of the whole rangeland ecosystem. The successive stages of the programme are: (1) carrying out of reconnaissance surveys to identify natural environments and related types of range cover, (2) evaluation of potentials of natural environments, (3) formulation of appropriate environmental exploitation measures, and (4) adoption of measures to preserve reclaimed areas. Approaches and initial results of the programme are presented. (Casey-Arizona)
W72-00166

VARIED RESPONSES TO INDIA'S AGRICULTURAL STRATEGY,
Harvard Univ., Cambridge, Mass.
D. D. Brown.
Asian Review, Vol 2, No 4, p 313-321, July 1969. 1 tab.

Descriptors: *Economic efficiency, *Productivity, *Crop response, *Soil types, *Irrigation efficiency, Rainfall, Economic impact, Fertilizers, Grains (Crops), Seeds, Marketing, Horticultural crops, Fertilization.
Identifiers: *India.

As part of India's agricultural objective of increasing food grain production to achieve self-sufficiency, the Intensive Agricultural Districts Programme (IADP), initiated in 1960, more than doubled extension education and input distribution and credit resources in one pilot district in each state. An upsurge in output subsequently occurred, due to exceptionally rapid growth in relatively few districts, and was highly selective as to crops. The rest of the districts balanced losses against gains, as a whole. In the rapid growth districts, either food grain productivity increased or shifts to cash crops accounted for the upsurge. Statistical studies showed that IADP activities were not responsible for those areas of increased productivity. Efforts were therefore made to correlate rapid growth in production with rainfall, soil types, irrigation, fertilizers and market factors. Little correlation was obtained with rainfall. The key factor appears to be soil quality. Other major factors influencing change were identified as shifts in relative prices and profitability among the crops competing for resource use within the limits of the district's high potential soils-environmental base and the time when the relative amount of irrigation added influenced shifts in cropping pattern, productivity and the use of fertilizers and other resources. (Casey-Arizona)
W72-00173

PAKISTAN'S WATER PROBLEMS AND THE LAW OF INTERNATIONAL RIVERS,
Ministry of Foreign Affairs Karachi (Pakistan).
For primary bibliographic entry see Field 06E.
W72-00179

SOME ASPECTS OF RESOURCE USE IN RELATION TO THE ORANGE RIVER PROJECT,
Cape Town Univ. (South Africa). Dept. of Botany.
A. M. Talbot.
South African Journal of Science, Vol 67, No 3, p 145-150, March 1971. 2 fig, 1 tab, 16 ref.

Descriptors: *Semiarid climate, *Grazing, *Crops, *Government supports, *Water policy, Land use, Planning, Integrated control measures, Grazing, Economic impact, Economic feasibility, Ecology, Regional analysis.
Identifiers: *South Africa.

Following World War I, South African agriculture suffered widespread improverishment, involving both soils and the people dependent on them. Various measures designed to stabilize the economy of

the rural sector and to increase its contribution to the economy, were taken to improve the infrastructure and for research in improving crop and livestock production technology. Farm assistance included loans and subsidies. Various programs included removal of irrigation restrictions on surface waters used for domestic use and stock, borehole drilling for stockmen, loans for jackal-proof fencing, special economic benefits during drought years, construction of reservoirs for irrigation water, restrictions on wheat and flour imports, and compulsory exports of surplus maize. Because subsidies, in addition to low-cost loans and below cost government construction processes, were tied to artificial price support policies, much of the agricultural sector was insulated from traditional market restrictions. The result was intensification of resource use were instituted without any restrictions to encourage improved farming methods. Because of rises in wheat prices due to import restrictions, regions once devoted to stockraising were converted to intensive wheat monoculture. Resulting decreases in grazing and fodder production shifted cattle production into extremely marginal regions and the increasing grazing pressures in these regions led to vegetation degradation and desert spread. While the problem is recognized, there is still evidence of lack of intra- or inter-regional integration of different branches of farming. (Casey-Arizona)
W72-00185

DESIGN CONSIDERATIONS FOR AGRICULTURAL DRAINS ON THE COLUMBIA BASIN PROJECT,
Bureau of Reclamation, Ephrata, Wash.
For primary bibliographic entry see Field 08B.
W72-00341

A MODEL FOR THE ECONOMIC EVALUATION OF WATER QUALITY IN IRRIGATION,
Hebrew Univ., Jerusalem (Israel); and Volcani Inst. of Agricultural Research, Bet-Dagan, (Israel).
D. Yaron, and E. Bresler.
Australian Journal of Agricultural Economics, p 53-62, June, 1970. 2 fig, 1 tab, 14 ref.

Descriptors: *Irrigation, *Irrigation water, *Saline soils, *Salt tolerance, *Mathematical models, Economic efficiency, Water quality, Linear programming, Optimization.

An approach for deriving the optimal combination of quality and quantity of irrigation water is presented. The model developed applies for given conditions of climate, soil, land use, and the relative cost of water quantity and quality; it is subject to restrictions on salt concentrations in the soil solution. The problem is to find the least cost combination of water quantity and salinity which provides for a given soil salinity index at the end of the irrigation period. Constrained optimization techniques give the necessary condition for the least cost quantity-quality combination; that is, the marginal rate of substitution of water salinity for quantity must equal the ratio of the cost per water unit adjusted for quality to the cost of varying the concentration of the given quantity of water by one p.p.m. A leaching model for tracing salt distribution in the soil profile under varying field irrigation conditions is also presented. This model is essentially a reformulation of the law of mass conservation, and optimal quantity-quality combinations are derived from it with the aid of linear programming methods. An illustrative application of this model is provided. (Settle-Wisconsin)
W72-00382

BEEF PRODUCTION ON IRRIGATED ALFALFA-D PASTURES,
C. R. Acord.
J Amer Vet Med Ass. 157 (11): 1970. 1564-1567. Copyright 1971, Biological Abstracts, Inc.
Identifiers: Alfalfa-D, Beef, Bloat, Control, Gastro, Grass-M, Intest-Drug, Irrigated, Pastures, Poloxalene, Production.
W72-00537

FLOOD DAMAGE TO CROPS IN DEPRESSION AREAS OF NORTHCENTRAL IOWA,
D. W. DeBoer, and W. F. Ritter.
Trans Asae (Amer Soc Agr Eng). 13 (5): 1970. 547-549, 553. Copyright 1971, Biological Abstracts, Inc.
Identifiers: Crops, Damage, Depression, Flood, Iowa, Northcentral, USA.
W72-00542

UNLINED MOLE LINES FOR IRRIGATION,
D. I. Norum, and D. M. Gray.
Trans Asae (Amer Soc Agr Eng). 13 (5): 1970. 661-663, 668. Copyright 1971, Biological Abstracts, Inc.
Identifiers: Clay, Drainage, Heavy, Irrigation, Lines, Method, Mole, Tight, Unlined.
W72-00545

FORECASTING DOWNY MILDEWS AND LATE BLIGHT IN ISRAEL,
J. Palti.
Israel J Agr Res. 20 (4): 1970. 184. Copyright 1971, Biological Abstracts, Inc.
Identifiers: Blight, Cucumber-D, Deficit, Downy, Forecasting, Grape-D, Israel, Mildews, Peronospora-Destructor, Phytophthora-Investans, Plasmopara-Viticola, Potato-D, Pseudoperonospora-Cubensis, Saturation, Temperature, Vine, Water.
W72-00549

OVERHEAD IRRIGATION OF APPLE-D ORCHARDS AS A FACTOR IN EPIDEMIC DEVELOPMENT OF BITTER ROT GLOEOSPORIUM-FRUCTIGENUM,
S. Pappo.
Israel J Agr Res. 20 (4): 1970. 184. Copyright 1971, Biological Abstracts, Inc.
Identifiers: Apple-D, Bitter, Development, Epidemic, Factor, Gloeosporium-Fructigenum, High, Irrigation, Orchards, Overhead, Rainfall, Rot, Temperature.
W72-00550

EFFECT OF AIR HUMIDITY ON THE DEVELOPMENT OF POWDERY MILDEW ON CUCURBITS-D,
R. Reuveni, and J. Rotem.
Israel J Agr Res. 20 (4): 1970. 185. Copyright 1971, Biological Abstracts, Inc.
Identifiers: Air, Cucurbits-D, Development, Humidity, Mildew, Moisture, Powdery.
W72-00551

TRENDS IN EPIDEMIOLOGICAL RESEARCH,
J. Rotem.
Israel J Agr Res. 20 (4): 1970. 185. Copyright 1971, Biological Abstracts, Inc.
Identifiers: Climatic, Diseases, Dispersal, Epidemiological, Plant, Spore, Trends.
W72-00552

AN AGRO METEOROLOGICAL METHOD OF FORECASTING THE APPEARANCE OF GRAPEVINE-D DOWNY MILDEW PLASMOPARA-VITICOLA IN ISRAEL,
J. Lomas.
Israel J Agr Res. 20 (4): 1970. 186. Copyright 1971, Biological Abstracts, Inc.
Identifiers: Agro, Annual, Downy, Forecasting, Grapevine-D, Humidity, Israel, Meteorological, Method, Mildew, Plasmopara-Viticola.
W72-00553

70 YEARS WITH WHEAT-M IN KENYA,
F. F. Pinto, and E. A. Hurd.
East Afr Agr Forest J. 36 (Spec Issue). 1970. 1-24. Copyright 1971, Biological Abstracts, Inc.
Identifiers: Breeding, Disease, Grain, Kenya, Milling, Moisture, Protein, Resistance, Wheat-M, Years, Yield.
W72-00554

04. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control of Water on the Surface

THE FOREST ENVIRONMENT--PROBLEMS AND PROMISES,
Oregon State Univ., Corvallis. Dept. of Forest Engineering.
For primary bibliographic entry see Field 06D.
W72-00010

SUPPRESSION OF CHANNEL-SIDE CHAPARRAL COVER INCREASES STREAMFLOW,
Rocky Mountain Forest and Range Experiment Station, Tempe, Ariz.
P. A. Ingebo.
Journal of Soil and Water Conservation, Vol 26, No 2, p 79-81, March-April 1971. 4 fig.

Descriptors: *Streamflow, *Flow agumentation, *Vegetation effects, *Chaparral, *Arizona, Chem-control, Shrubs, Trees, Flow rates, Watershed management, Rainfall-runoff relationships.
Identifiers: *Streamflow increases, *Chaparral stream-cover control.

Shrubs and trees along well-defined stream channels in a 246-acre chaparral-covered watershed in central Arizona were chemically suppressed in 1967. Both duration and volume of streamflow increased in the 2 years following treatment. Streamflow, which is normally intermittent during summer and fall, became continuous. In 1968 and 1969, flow increased 0.63 and 0.97 area inches (32 and 54%), respectively, or in terms of the treated area only (15% of the watershed), 4.1 and 6.3 inches, respectively. Most of the increase in volume came during the time of major flows, December through April. Shrub and tree kill on the treated area will probably exceed 80%. Native grasses and forbs are increasing on the treated area. (Woodard-USGS)
W72-00054

FOOD PLAIN INFORMATION, BAD RIVER AT FORT PIERRE, SOUTH DAKOTA.
Corps of Engineers, Omaha, Nebr.

Army Corps of Engineers Flood Plain Report, May 1971. 25 p, 2 plate, 3 tab.

Descriptors: *Floods, *flood damage, *Flood plains, *South Dakota, Regional flood, Flood forecasting, Flood control, Historic flood, Peak discharge.
Identifiers: *Floods (Fort Pierre S Dak), Standard Project Flood, Intermediate Regional Flood.

Flooding along the Bad River at Fort Pierre, South Dakota is described to aid in solving local flood problems and in planning the best utilization of flood-prone lands. Maps, profiles, cross sections and other material relating the extent of past flooding to floodswhich might occur in the future are based on available records of rainfall, runoff, historical flood heights, and other technical data. The greatest flood on the Bad River at Fort Pierre occurred in July 1905 and had an estimated discharge of ?0,000 cfs. The Intermediate Regional Flood for the Bad River at Fort Pierre is 60,000 cfs and the Standard Project Flood discharge is 152,000 cfs. (Woodard-USGS)
W72-00055

DISPATCHING SYSTEM FOR CONTROL OF COMBINED SEWER LOSSES,
Minneapolis-Saint Paul Sanitary District, Minn.
For primary bibliographic entry see Field 05G.
W72-00080

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR ELM FORK TRINITY RIVER, TRINITY RIVER BASIN, TEXAS, 1969,
Geological Survey, Austin, Tex. Water Resources Div.
For primary bibliographic entry see Field 07C.
W72-00097

THE DRAINAGE BASIN AS THE FUNDAMENTAL GEOMORPHIC UNIT,
Cambridge Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 02J.
W72-00102

DAMS AND ECOLOGY--CAN THEY BE MADE COMPATIBLE,
Civil Engineering Magazine, New York.
For primary bibliographic entry see Field 08A.
W72-00116

SOME ECOLOGICAL EFFECTS ON THE USE OF PARAQUAT FOR THE CONTROL OF WEEDS IN SMALL LAKES,
Nature Conservancy, Abbots Ripton (England). Monks Wood Experimental Station; and Imperial Chemical Industries Ltd., Jealott's Hill (England). Jealott's Hill Research Station; and Nottingham Univ. (England). Dept. of Botany.
J. M. Way, J. F. Newman, N. W. Moore, and F. W. Knaggs.
The Journal of Applied Ecology, Vol 8, No 2, p 509-532, 1971.

Descriptors: *Herbicides, *Aquatic weed control, *Paraquat, *Environmental effects, Diquat, Algae, Algal control, Diatoms, Persistence, Bacteria, Birds, Fish, On-site investigation, Methodology, Invertebrates, Amphibians, Toxicity, Chara, Submerged plants, Protozoa, Euglena, Chlamydomonas, Chlorophyta, Scenedesmus, Cyanophyta, Mollusks, Mites, Annelids, Crustaceans.
Identifiers: Biological effects, Nottingham (England), Polygonum, Typha, Elodea.

The results of paraquat applications to a series of small lakes were studied and the biological effects and paraquat residue determinations described. In two experiments in lakes at Oxton, Nottinghamshire (England), 0.5 mg/l paraquat eradicated all submerged and floating plants, except Polygonum amphibium and Chara, within 32 days of application. One lake remained substantially free of vegetation for two years after treatment. No mats of filamentous algae developed in the treated lakes although they were widespread in adjacent untreated lakes. Changes in species and populations of planktonic algae and diatoms and increases in population of bacteria soon after treatment were observed. Survival of captive populations of Asellus, Lymnaea and Sialis larvae up to four days after treatment and observations on other free-living invertebrates were recorded. The chemical did not apparently cause any important mortality of invertebrates. Paraquat disappeared rapidly from the water. Significant quantities of the chemical were found in the weeds within 24 hours of application. There was a gradual buildup of paraquat residues in bottom deposits up to 32 and subsequent 197 days after application with a marked fall-off at 364 days. (Jones-Wisconsin)
W72-00155

EXPERIMENTAL CRITERIA FOR STUDYING GRASS CARP FEEDING IN RELATION TO WEED CONTROL,
Fish Culture Research Training Inst., Malacca (Malaysia).
G. A. Prowse.
The Progressive Fish-Culturist, Vol 33, No 3, p 128-131, 1971.

Descriptors: *Carp, *Aquatic weed control, *Fish diets, Age, Size, Temperature, Oxygen, Plankton, Copepods, Rotifers, Insects, Algae, Chara, Respiration, Spawning, Fish hatcheries.
Identifiers: Ctenopharyngodon idellus, White amur, Stocking density, Dentition, Malacca (Malaysia).

Doubt as to the use of grass carp (white amur) for aquatic weed control is resolved and evidence substantiated that it is primarily a herbivore. Their pharyngeal teeth are peculiarly adapted to tearing plant material. Succulent plants with negligible fiber have high selectivity and ingestion--Hydrilla, Anacharis, Elodea, and Logarosiphon. Temperature affects various fish activities; in Malacca, feeding activities seem to decrease above 33 C. It is not clear whether the seasonal effect upon spawning is day-length or change in temperature but apparently during the spawning season fish may not eat. Size of pond and stocking density are interacting factors; there is increasing evidence that in small ponds fish suffer stress increasing with density and fish size. Decrease in oxygen content lowers metabolic rate and activities. When fish are violently or repeatedly disturbed, they suffer stress which can affect feeding habits. Flowing water, possibly by flushing away excretory metabolites, apparently increases ingestion rate; flow, itself, is not the causative agent but may result in a better diurnal oxygen balance, however it must be accompanied by change of water. Grass carp can be trained to eat certain foods. (Jones-Wisconsin)
W72-00163

HOW DOES FOREST-RANGE CONVERSION IN OZARK UPLANDS AFFECT RUNOFF,
James A. Ferguson.
Arkansas Farm Research, July-August, p 3, 1971. 1 tab.

Descriptors: *Runoff, *Forests, *Arkansas, Hydrologic aspects, Hardwood, Pine trees, Precipitation (Atmospheric), Seasonal, Grasses, Ranges, Erosion.
Identifiers: *Forest conversion, *Ozarks, *Uplands.

A 25-year study is continuing in the Ozark uplands of alternative uses of hardwood forest-ranges since production of hardwood forests in that region is characteristically very low. Information was needed on how the different uses affect the area's hydrological characteristics. Alternative uses considered are conversion of hardwood forest to rangeland and to higher-producing softwood (pine forests). Time and amount of runoff were recorded in six small watersheds (one in each 40-acre range block, two in hardwood blocks, and one in a pine block). The ratio of runoff to precipitation for all storms producing runoff during the months of December, January, and February is recorded and for runoff-producing storms in the spring. Analysis shows that in North-central Arkansas, the month of April has approximately twice the erosion hazard of any other month. Preliminary results indicate that conversion of hardwood forest to pine without mechanical clearing produces a distinct reduction in runoff in the first five years, particularly in the winter months; conversion of hardwood forest to rangeland without mechanical clearing may increase runoff somewhat for one to two years, after which runoff is reduced somewhat up to five years. (Jones-Wisconsin)
W72-00164

DITCH DRAINAGE OF ANISOTROPIC NON-HOMOGENEOUS POROUS MEDIA: A MODEL STUDY,
Auburn Univ., Ala. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 02G.
W72-00309

MEASUREMENT OF INTERFLOW AND DEEP SEEPAGE ON PIEDMONT WATERSHEDS,
Clemson Univ., S.C.
For primary bibliographic entry see Field 02G.
W72-00311

DESIGN CONSIDERATIONS FOR AGRICULTURAL DRAINS ON THE COLUMBIA BASIN PROJECT,
Bureau of Reclamation, Ephrata, Wash.
For primary bibliographic entry see Field 08B.
W72-00341

ESTIMATING SOIL PERMEABILITY RATES,
Harza Engineering Co., Chicago, Ill.
For primary bibliographic entry see Field 02G.
W72-00345

NAVIGATION CONDITIONS IN FORT SMITH REACH, ARKANSAS RIVER. HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08B.
W72-00360

EFFECTS OF RESERVOIR OPERATING POLICY ON RECREATION BENEFITS,
Virginia Polytechnic Inst. and State Univ., Blacksburg.
J. M. Morgan, and P. H. King.
Water Resources Bulletin, Vol 7, No 4, p 765-773, August 1971. 4 fig, 4 tab, 15 ref.

Descriptors: *Reservoirs, *Reservoir operation, *Recreation, *Recreation demand, *Benefits, *Water resources development, *Multiple purpose, Water levels, Optimization, Data collecting, Statistics.
Identifiers: *Quantification, Losses, Computerized analysis.

In recent years the attention given recreation in multiple purpose water resource development has increased dramatically. However, because of their very nature, the benefits and losses accruing to such projects from recreation, or the lack of it, have been extremely difficult to quantify. One of the factors that affects recreation benefits is the fluctuation in the water level of the impoundment. This research was undertaken with the goal of making available to the water resources planner an improved tool for including a realistic recreation benefit-loss function in the development of a model to determine optimum reservoir operating policy. Primary attention was given to reservoirs whose water levels changed appreciably during the recreation season, but data from reservoirs that were not drawn down were also collected in order to maintain a control, so that relevant conclusions could be drawn. Background information including the normal level of recreation activity, accessibility of the area to center of population, weather patterns, topographic features, and other data pertinent to specific cases were also gathered. A computerized analysis was developed in order to quantify the results and to draw conclusions on the basis of statistical inferences developed from the data. For the reservoirs which showed widely fluctuating water levels, no statistically significant relationship was shown to exist between water-level and recreation attendance for the month of July for the nine-year period 1958-1966. (Strachan-Chicago)
W72-00399

4C. Effects on Water of Man's Non-Water Activities

UTILIZATION OF INTERSTATE HIGHWAY CONSTRUCTION TO CREATE PRODUCTIVE WETLANDS FOR WILDLIFE,
Massachusetts Univ., Amherst, Dept. of Forestry and Wildlife.
K. L. Bergstrom.
Massachusetts University Water Resources Research Center Report, May 1971. 72 p, 7 fig, 2 tab, 51 ref, 5 append. OWRR B-004-Mass (4).

Descriptors: *Westland, *Highways, *Highway effects, *Habitats, *Environmental effects, *Wildlife habitats, Recreation, Scenery, Highway beautification, Planning, Road construction, Road design.
Identifiers: Interstate highways.

The construction of interstate highways offers on opportunity to create productive wetlands with a minimum of additional expense if they are developed as an integral part of the highway. Through the use of the highway embankment as an impoundment structure and/or the careful location and development of borrow pits, numerous wetlands can be developed. Many benefits would accrue from projects involving combined development of highways and wetlands. The wetlands would provide scenic enhancement to the highway. Rest stops adjacent to wetlands would provide recreational opportunities to travellers as well as to the local citizenry. Wetlands create much valuable habitat for a variety of mammals and birds as well as providing sources of recreation. These wetlands could be excavated to the desired morphometry while supplying fill for the highway. Highway embankments could be located so as to provide water retaining structures as needed. Planning prior to construction would give assurance that the productivity of the resultant wetlands would be improved. (See also W72-00052) (Knapp-USGS)
W72-00053

EROSION BY WATER ON HILLSLOPES,
Bristol Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 02J.
W72-00106

THE FISHERY POTENTIAL OF FOUR AQUATIC ENVIRONMENTS CREATED BY INTERSTATE ROUTE 91 CONSTRUCTION IN MASSACHUSETTS,
Massachusetts Univ., Amherst.
J. C. Moulton.
M. S. Thesis, September 1970. 86 p, 11 fig, 8 tab, 36 ref, 8 append.

Descriptors: *Highway effects, *Fish farming, *Aquatic habitats, *Fish management, *Growth rates, *Productivity, Environmental effects, Habitats, Aquiculture, Ponds, Reservoirs, Massachusetts, Fish conservation, Fish establishment, Aquatic environment, Reservoir fisheries, Yellow perch, Sunfishes, Bass, Fish food organisms.
Identifiers: Construction effects.

Four borrow pit ponds created as a result of Interstate Route 91 construction in Whately, Mass., were studied to determine their fishery potential. Physical, biological and chemical data were collected to determine the ecological conditions in each pond. These data indicate that 91 South, 91 Swim and 91 North are capable of supporting a warm-water sport fishery. The low pH of 91 Woods is a limiting factor and no fish are present here. Age a growth studies were conducted on populations of yellow perch, pumpkinseed, bluegill and largemouth bass. Growth rates are compared between ponds and with other studies. Population estimates for largemouth bass in 91 South are included. Yellow perch, pumpkinseed and bluegill stomachs were examined for food content, and terrestrial organisms comprised only a small portion of their diets. The average percentage composition, percent volume, percent frequency of occurrence and total number of organisms in biweekly stomach samples are presented. Management recommendations are made for increasing the fishery potential of existing borrow pit ponds and guidelines are presented for future construction and management. (LeGore-Washington)
W72-00135

POSSIBLE EFFECTS OF HUMAN ACTIVITY ON WORLD CLIMATE,
British Meteorological Office, Bracknell (England).
For primary bibliographic entry see Field 05C.
W72-00171

WEBERS FALLS LOCK AND DAM, ARKANSAS RIVER NAVIGATION PROJECT: HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08B.
W72-00347

4D. Watershed Protection

INTRODUCTION TO FLUVIAL PROCESSES.
For primary bibliographic entry see Field 02J.
W72-00100

STREAMFLOW, SEDIMENT-TRANSPORT, AND WATER-TEMPERATURE CHARACTERISTICS OF THREE SMALL WATERSHEDS IN THE ALSEA RIVER BASIN, OREGON,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02E.
W72-00115

FLOOD-PLAIN MANAGEMENT MUST BE ECOLOGICALLY AND ECONOMICALLY SOUND,
For primary bibliographic entry see Field 02E.
W72-00117

THE GEOMORPHOLOGY OF CENTRAL AUSTRALIA, (GEOMORPHOLOGIE VON ZENTRALAUSTRALIEN NACH H. BREMER),
Wuerzburg Univ. (West Germany). Geographisches Institut.
For primary bibliographic entry see Field 02J.
W72-00170

05. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification of Pollutants

NEW APPLICATIONS OF ON-STREAM ANALYSERS IN PULP MILLS,
Calgon Corp., Pittsburgh, Pa.
H. M. Rivers, and E. D. Neuberger.
Technical Association of the Pulp and Paper Industry, Vol 53, No 7, July 1970. p 1250-1254, 6 fig, 10 ref.

Descriptors: *Pulp and paper industry, *Automatic control, Measurement, Acidity, Alkalinity, Conductivity, Chlorine, Ions, Water analysis, *Monitoring, Pollutant identification, Sampling, *Pulp wastes, Industrial wastes, Analytical techniques.
Identifiers: *On-stream analysis.

On-stream analysers developed in recent years for industrial water monitoring and control have been successfully modified and applied to certain specific needs in pulp mills. Automatic titration systems are being used to analyse for acid or alkali content in pulp mill waste or process streams and for chlorine residuals in bleach plant operations. Sodium content in recovery furnace stack gas is being accurately (0.1 ppm) and reliably determined by a selective ion electrode. Differential conductivity analysers are reliably and accurately determining the effective alkali in kraft process black liquor due to special sample handling facilities and a unique means of neutralizing these samples. The applications of on-stream sampling devices are reviewed with emphasis on their value as pollution abatement, quality control, plant economics and research devices. By providing an abundance of reliable information about plant processes, automatic on-stream analysers afford many opportunities for effecting improvements in pulping operations. (Goessling-Texas)
W72-00009

A FIELD STUDY OF INORGANIC NITROGEN OXIDATION RATES,
Michigan Univ., Ann Arbor.
For primary bibliographic entry see Field 05B.
W72-00018

METHOD OF A NEW DIFFERENTIAL THERMAL ANALYSIS,
Missouri Univ., Columbia.
L. Hemphill, A. D. Ray, and E. L. Simmons.
Proceedings, Industrial Waste Conference, 24th, May 6, 7, and 8, 1969. p 1060-1071, 11 fig, 1 tab, 2 ref.

Descriptors: *Differential thermal analysis, *Organic compounds, Soaps, Theoretical analysis, Laboratory tests, Organic wastes, Temperature, *Thermal properties.
Identifiers: *Sensitivity, Starch, Copper oxide.

A study has been conducted to determine a specific method of differential thermal analysis (DTA) for organic waste materials and to determine the exothermic DTA response. A previous study indicated that: (1) organic waste materials produced characteristic exothermic and endothermic patterns; (2) the exothermic peak was directly proportional to the organic sample mass; (3) the scope of the pattern changed during biological oxidation; and, (4) the results of DTA, a thermogram, contains quantitative and qualitative information. Copper oxide was selected as a sample diluent to provide oxygen for the reaction on an 'as needed' basis and to reduce base-line drift. Test results showed that this substance probably accounts for an increased sensitivity and response due to the high thermal conductivity of the compound. This procedure was tested with soap and soluble starch, separately and in combination. The results were reproducible thermograms of the substances using sample sizes as small as 3 mg. Certain combinations of the test materials produced a smeared thermogram. Organic thermograms show the same type of general response developed in optical spectroscopy together with a 'smear effect.' Increased instrument resolution and comprehensive study are requisite for development of specific DTA thermogram-organic molecular basic relationships. (Goessling-Texas)
W72-00030

A CRITICAL REVIEW OF BOD ANALYSIS USING RESPIROMETER TECHNIQUES,
Hydroscience, Inc., Leonia, N.J.
E. L. Barnhart, and G. J. Kehrberger.
Proceedings, Industrial Waste Conference, 24th, Mah 6, 7, and 8, 1969, p 1385-1397. 11 fig, 2 tab, 10 ref.

Descriptors: *Biochemical oxygen demand, Nitrification, Mathematical models, Carbonaceous oxygen demand, Pollutant identification, Computer models, Measurements.
Identifiers: *Respirometers, Seed concentration, Sample concentration, Standard Methods.

Large computer models of national rivers are being developed to provide information of the steps required to achieve the desired levels of water quality. Current estimates of the costs for these steps are in excess of 250 billion dollars. It is obvious that better information than that supplied by the five day BOD test must be available for these models. A study of the generally accepted methods of respirometric analysis was conducted to determine the applicability and limitations of the methods. The Gibson respirometer and the Warburg apparatus were tested under conditions of varying mixing rates, seed concentrations and sample concentrations. Baseline variations were determined in order to estimate the precision of the systems. Respirometric techniques can be used to measure the carbonaceous oxygen demand but the random error may become significant if dilute concentrations are considered. Nitrification is not accurately described by respirometer measurements. The use of respirometer techniques can supply ad-

ditional information on the oxygen use requirements, however, care must be taken in the tests or erroneous conclusions can be drawn. The best operating conditions are essentially those suggested by 'Standard Methods'. (Goessling-Texas)
W72-00036

DIRECT DIGTAL CONTROL AT GRAND RAPIDS, MICHIGAN,
McNamee, Porter and Seeley, Ann Arbor, Mich.
For primary bibliographic entry see Field 05D.
W72-00043

GAS ABSORPTION IN A HETEROGENEOUS SYSTEM,
Iowa State Univ., of Science and Technology, Ames. Engineering Research Inst.
A. Mukerjee, and G. T. Tsao.
Paper presented at Biochemical Engineering Symposium, Montreal, Canada, October 12-15, 1971; Canadian Society for Chemical Engineering. 29 p, 13 fig, 10 ref. OWRR Project A-032-IA (7).

Descriptors: *Mass transfer, *Chemical reactions, *Gases, *Oxygen, Heterogeneity, Organic compounds, Organic acids, Theoretical analysis, Laboratory tests, Analytical techniques, Dissolved oxygen, Absorption, Fermentation.
Identifiers: *Gas absorption systems, *Glucose, *Gluconic acid.

Gas absorption in a heterogeneous system was investigated to determine the effect of bacterial cell particles on the mass transfer rate of oxygen in the simultaneous oxidation of glucose to gluconic acid. Experiments conducted with two cultures, Acetobacter rancens (NRRL B65) and Acetobacter suboxygens (NRRL B72), showed effects of surface activity of cellular particles on mass-transfer coefficient. It was determined that the aerobic oxidation of glucose to gluconic acid is a relatively fast peudo-first order reaction with respect to oxygen, in the presence of excess glucose. This reaction is enhanced markedly by acetic acid bacteria B65 and B72, the oxidation being partly mediated by a cytochrome-dependent enzyme system. The experiment was conducted at the optimal conditions of temperature (25 degrees C and pH 6.12) under which the reaction was found to be rapid. The rate at which the dissolved oxygen concentration decreased from 100% saturation to 0% saturation is a measure of the reaction rate. Under strict considerations the simultaneous oxygen absorption from the atmosphere should be accounted for together with the chemical reaction. The reaction rate was much greater than the mass transfer coefficient. (Woodard-USGS)
W72-00085

METHODS FOR CHEMICAL ANALYSIS OF WATERS AND WASTEWATERS,
Department of Fisheries and Forestry, Ottawa (Ontario). Inland Waters Branch.
For primary bibliographic entry see Field 02K.
W72-00086

MISSOURI STREAM STUDIES RELATING TO THE 'NEW LEAD BELT',
Missouri Univ., Rolla.
For primary bibliographic entry see Field 05B.
W72-00089

INTERPRETATION OF RESULTS FROM THE STUDIES OF POLLUTION OF SURFACE FLOWING WATERS,
Water Economics Research Inst., Wroclaw (Poland). Water Protection Research Section.
H. Manczak, and H. Florczyk.
Water Research, Vol 5, No 8, p 575-584, August 1971. 14 fig, 9 ref.

Descriptors: *Water quality, *Streamflow, *Water pollution, *Self-purification, *Waste dilution, Streams, Flow rates, Water chemistry, Chemical analysis, Hydrologic data, Data collections, Sampling, Stream gages, Foreign projects, Runoff coefficient.
Identifiers: *Streamflow-water quality relationships, Great Britain, Germany, Poland.

Relationships between concentration of various water quality parameters and the rate of streamflow were established from data collected at monitoring stations on rivers in Great Britain, Germany and Poland. Three basic types of the curve representing this correlation include data for heavily polluted rivers, for unpolluted rivers and for rivers with intermediate pollution. The conditions for the application of this interpretation are that the sampling of river water is performed simultaneously with the rate of flow measurements and that a sufficient number of observations is made preferably over the whole amplitude of flows occurring in a given research period. The highest degree of accuracy in evaluation of the state of pollution of a river defined by means of regression equations established statistically, is obtained from the observations gathered by continuously operating automatic water quality monitoring stations. (Woodard-USGS)
W72-00125

THE CHEMICAL STATES OF COPPER IN POLLUTED FRESH WATER AND A SCHEME OF ANALYSIS TO DIFFERENTIATE THEM,
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 05B.
W72-00126

CHEMISTRY OF NATURAL WATERS - III CARBONIC ACID,
National Inst. for Water Research, Congella (South Africa) Regional Lab.
P. H. Kemp.
Water Research, Vol 5, No 8, p 611-619, August 1971. 4 tab, 7 ref.

Descriptors: *Water chemistry, *Natural streams, *Organic acids, *Alkalinity, *Carbon dioxide, Water temperature, Mathematical studies, Equations, Chemical reactions, Hydrologic data, Data collections, Streams, Surface waters, Foreign projects, Equilibrium, Atmosphere.
Identifiers: *Africa, *Durban (South Africa), *Carbonic acid.

A convenient approximation equation to enable the carbonic acid to be calculated from the pH and total alkalinity is derived and presented in tabular form, and the direct determination of the carbonic acid is discussed. A similar equation and table for the calculation of the free carbonic acid is also given. The solubility of carbon dioxide in natural waters at 25 degrees C depends on the total alkalinity of the water. Equations and a numerical table enable the percentage saturation of a water with carbon dioxide to be calculated, and it is concluded that this percentage saturation is a more reliable parameter for the detection of pollution than is the concentration of free carbonic acid. Data for unpolluted rivers of Natal, South Africa, shows that they are virtually in equilibrium with atmospheric carbon dioxide. If this is a general feature of surface waters, it explains why the pH values of such waters, even those with very poor buffering powers, remain so constant. It also explains why waters in treatment works often do not show the pH response to chemical dosing that they theoretically should. (Woodard-USGS)
W72-00127

ACIDITY CONTROL IN BALD EAGLE CREEK AND WEST BRANCH SUSQUEHANNA RIVER, CLINTON COUNTY, PENNSYLVANIA.
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 05B.
W72-00128

THE AUTOMATIC DETECTION OF LOW LEVELS OF DISSOLVED FREE CHLORINE IN FISH FARMING EXPERIMENTS USING SEA-WATER EFFLUENTS,
White Fish Authority, West Kilbride (Scotland). Marine Fish Cultivation Unit.
For primary bibliographic entry see Field 05C.
W72-00141

THE USE OF BIOLOGICAL ANALYSES AS INDICATORS OF WATER QUALITY,
Indiana State Univ., Terre Haute. Dept. of Life Sciences.
Richard D. Brown.
Journal of Environmental Health, Vol 34, No 1, p 62-66, 1971. 7 fig, 11 ref.

Descriptors: *Analysis, *Indicators, *Water quality, Invertebrates, Biological communities, Diatoms, Sampling, Limestones, Bioassay, Potable water, Water pollution, Indiana.
Identifiers: Macroinvertebrates, McCormick's Creek (Ind), Honey Creek (Ind).

To obtain the necessary information relevant to characterization of a polluted situation, many different analyses may be used, but the greatest concern is the development of an adequate method for detection of life-injuring substances in water supplies. Many attempts have been made to utilize in situ biological material as an indicator of the state of water quality. Recently methods utilize invertebrate assemblages as indicators of pollution to avoid dependence on each particular species in its reflection of environmental change. A method of biological analysis is described which the sanitarian may utilize to obtain some indication as to the presence of life-injuring substances. The method involves tabulation of the number of individuals per each family of a macroinvertebrate assemblage and fitting the data to a truncated log-normal distribution, which apparently represents the natural structure for most communities. Four widely differing points were sampled and plotted; the tabulations indicate community structures. While limitations of this biological analysis are recognized, its intention is to supplement established procedures and give added dimension to the process of assessing water quality. (Jones-Wisconsin)
W72-00154

THE USE OF RADIOACTIVE CARBON METHOD IN STUDIES OF TROPHIC RELATIONSHIPS OF PLANKTON (PRIMENENIE RADIOUGLERODNOGO METODA DLYA ISUCHENIYA TROFICHESKIKH VZAIMOOTNOSHENII V PLANKTONE),
Akademiya Nauk SSSR, Leningrad. Zoologicheskii Institut.
For primary bibliographic entry see Field 05C.
W72-00161

GLOBAL ENVIRONMENTAL MONITORING,
Center for the Environment and Man Inc., Hartford, Conn.
For primary bibliographic entry see Field 05C.
W72-00162

WATER RESOURCE POLLUTANT IDENTIFICATION BY DIGITAL COMPUTER ANALYSIS OF REMOTE INFRARED SENSOR SPECTRAL INTENSITIES,
Clemson Univ., S.C. Dept. of Electrical Engineering.
B. E. Gilliland.
In: Record of the 1969 Institute of Electrical and Electronics Engineers Systems Science and Cybernetics Conference, October 22-24, 1969, Philadelphia, Penn: The Institute of Electrical and Electronic Engineers Catalog No 69C37-SSC, p 64-69, 1969. 5 fig, 12 ref. OWRR S-016-SC (1).

Descriptors: *Water pollution, *Water quality control, *Water analysis, *Remote control, *Digital computers, Telemetry, Inrared radiation, Analyti-

cal techniques, Water quality, Model studies, Spectrometers.
Identifiers: *Water pollutant identification, *Water quality monitoring, Infrared sensor.

Digital computer analysis of remotely sensed spectral radiance in a select set of wavelength bands in the middle infrared region was used to identify pollutant substances in water bodies. Qualitative and quantitative analysis techniques were explored, with applications in surveillance and monitoring of water quality, extended to potential automatic control of waste water discharge. Pollution events can potentially be identified and monitored on-line in an essentially real-time operation using multiband remote infrared radiation sensors coupled with a digital computer. Identification of pollutants results from a successful comparison of the multiband spectral radiance information incident on the sensor system from an unknown source to that of predetermined and computer stored spectral signature. The digital computer eliminated problems associated with complex logic circuitry and permits extension to more sophisticated pattern recognition strategies as needed. (Woodard-USGS)
W72-00305

EFFECT OF HUMIC ACIDS ON IRON ANALYSES IN NATURAL WATERS,
South Florida Univ., Tampa. Dept. of Chemistry.
For primary bibliographic entry see Field 02K.
W72-00315

DYNAMICS OF THE NITROGEN CYCLE IN LAKES,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 05C.
W72-00354

INVESTIGATION OF TECHNIQUES TO PROVIDE ADVANCE WARNING OF GROUND--WATER POLLUTION HAZARDS WITH SPECIAL REFERENCE TO AQUIFERS IN GLACIAL OUTWASH,
Washington State Univ., Pullman. Water Research Center.
For primary bibliographic entry see Field 05B.
W72-00358

DETERMINATION OF SODIUM IN BLACK LIQUOR USING A SELECTIVE ION ELECTRODE,
St. Regis Paper Co., West Nyack, N.Y.
For primary bibliographic entry see Field 05D.
W72-00416

CONSTANT FLOW DELIVERY DEVICE FOR CHRONIC BIOASSAY,
R. A. Freeman.
Trans Amer Fish Soc. 100 (1): 1971. 135-136.
Copyright 1971, Biological Abstracts, Inc.
Identifiers: Apparatus, Bioassay, Chronic, Constant, Delivery, Device, Fish, Flow, Hatchery, Water.
W72-00527

5B. Sources of Pollution

A FIELD STUDY OF INORGANIC NITROGEN OXIDATION RATES,
Michigan Univ., Ann Arbor.
C. T. Wezernak, and J. J. Gannon.
Proceedings, Industrial Waste Conference, 24th, May 6, 7, and 8, 1969, p 53-68, 9 fig, 5 tab, 11 ref.

Descriptors: *Water pollution sources, *Dissolved oxygen, *Nitrification, Photosynthesis, Data collection, Sampling, Laboratory tests, Effluents, Pollutant identification, *Effluent streams, Path of pollutants, Michigan.
Identifiers: *Nitrogenous oxygen demand, Nitrobacteraceae, Allylthiourea, Clinton River (Mich), *Pontiac (Mich).

It is generally recognized that nitrogenous compounds contained in waste treatment plant effluents can have a dramatic impact on the oxygen resources of the receiving stream. Accordingly, a study was conducted on the Clinton River below Pontiac, Michigan, to determine the actual influence of the nitrogenous oxygen demand on the dissolved oxygen concentrations in the stream. A combined field measurement program and laboratory experiments were undertaken to establish the rates of oxidation of ammonia to nitrites and nitrites to nitrates. Rapid nitrification was observed in the stream studied, indicating that inorganic nitrogen oxidation was the major deoxygenation component in the section studied. The data collected indicates that nitrification can be evaluated through the use of the equation derived, eliminating the need for long term laboratory tests to determine rate parameters. The fact that the data needed for this determination are taken from the stream itself automatically takes into account the host of physical, chemical and biological factors which influence the rate of nitrification. Allylthiourea at a concentration of 0.5 mg/l was used as a nitrification inhibitor in some of the experiments. This substance did not completely inhibit nitrification but it did block the first step in the process. (Goessling-Texas)
W72-00018

POLLUTANTS LEACHED FROM SELECTED SPECIES OF WOOD IN LOG STORAGE WATERS,
Oregon State Univ., Corvallis.
J. L. Graham, and F. D. Schaumburg.
Porceedings, Industrial Waste Conference, 24th, May 6, 7, and 8, 1969, p 99-114, 10 fig, 1 tab.

Descriptors: *Water pollution sources, *Leaching, Lignins, Organic compounds, Chemical oxygen demand, Total organic carbon, Wood wastes, Pollutant identification.
Identifiers: *Log storage waters, Tannins.

A study has been conducted to determine quantitatively the rate of leaching of selected pollution indicators from logs floating in fresh and saline waters. Douglas fir and ponderosa pine logs were submerged in tanks in the laboratory for these tests. In each case the water was poisoned to inhibit any biological activity which might influence the tests conducted. Test logs were submerged for periods of from 40 to 80 days and tests were made periodically on the water to determine concentrations of lignin-like substances and tannins, and doluble organics as measured by COD, TOC and total volatile solids tests. The results of these tests indicate that: (1) bark contributes most of the color producing substances leached from floating logs; (2) Ponderosa pine logs yield significantly greater quantities of organic matter than Douglas fir logs; (3) intact bark tends to reduce the initial rate of loss of soluble organic matter from logs; (4) cross-cut ends of logs tends to expedite the release of color and soluble organics; (5) the concentration of soluble organics in the holding water affects the leaching rate; and, (6) the extraction of soluble organics from floating logs occurs at a near constant rate in flowing waters. (Goessling-Texas)
W72-00019

CHLORINATED HYDROCARBONS: EMERGING IMPLICATIONS IN REGIONAL PLANNING,
Engineering-Science, Inc., Oakland, Calif.
T. G. Shea, and W. E. Gates.
Proceedings, Industrial Waste Conference, 24th, May, 6, 7, and 8, 1969, p 1448-1463. 5 tab, 1 fig, 10 ref.

Descriptors: *Water quality, *Chlorinated hydrocarbon pesticides, Waste water treatment, Agriculture, Industrial wastes, Municipal wastes, Effluents, Data collection, Sediments, Tidal effects, Advection, Sewage treatment, California, Water pollution sources, Pesticides, Path of pollutants.
Identifiers: *San Francisco Bay-Delta System, Mass balance.

The San Francisco Bay-Delta Water Quality Control Program was conducted during 1966-1968 with the objectives of assessing the magnitude and effects of waste water discharges in the 12-county area encompassing San Francisco Bay. It was found that much information on chlorinated hydrocarbons in agricultural drainage had been developed. There was no information which permitted an estimation of the quantities of chlorinated hydrocarbons entering San Francisco Bay from municipal and industrial sources or of the quantities of these substances from municipal, industrial and agricultural sources being transported through or accumulating in San Francisco Bay. This study was designed to estimate emmission levels of chlorinated hydrocarbons in waste water, determine concentrations of these substances in the water and sediments of the Bay-Delta region and to formulate a mass balance of pesticides into and through the area. DDD-DDT DDE, hetachlor epoxide and lindane were found at levels of 300 to 1300 mg/l in municipal primary and secondary effluents. Two municipal effluents receiving secondary treatment had greatly reduced levels of these substances. Chlorinated hydrocarbons concentrations in the sediment were generally 1000 greater than in the overlying water column. Mass balances indicate an input of approximately 20,000 pounds of chlorinated hydrocarbons. Tidal action and advection remove 80% and 15% is stored in the water and sediments of the Bay. (Goessling-Texas)
W72-00038

A METHODOLOGY FOR DETERMINING OPTIMUM LONGITUDINAL SPACING OF EFFLUENT DISCHARGES INTO A RIVER,
Massachusetts Univ., Amherst. Water Resources Research Center.
Ronald W. Deacon.
Doctoral Dissertation, Industrial Engineering, August 1970. 131 p, 16 fig, 17 tab, 38 ref. OWRR B-011-MASS (6).

Descriptors: *Mathematical studies, *Outlets, *Cost analysis, Data processing, Dissolved oxygen, Biochemical oxygen demand, Dispersion, Mixing, Waste water treatment, Water quality control, Effluents, Effluent streams, Optimum development plans.
Identifiers: *Stream assimilative capacity, *Algorithms, *Effluent discharges.

Multiple discharge points from a single effluent source, such as a waste treatment plant, have been suggested as having some benefit over a single outfall. Results of testing here indicated that a stream is more able to assimilate increased quantities of influent flow when the discharge is not from a point source, but from spaced sources. Also, a single outfall causes the minimum D.O. level to be more sensitive to increased volumes of influent, often resulting in a violation of stream standards. An algorithm was then formulated from the data obtained to determine optimal configurations. The data then required for analysis was of five types: (1) Input waste water conditions; (2) Input stream conditions prior to the first discharge; (3) Input quality criteria; (4) Input search increments; (5) Input cost data. Average minimum conditions of flow are usually sufficient to ensure good plant operation. Use of the algorithm demonstrated that the cost of optimal configurations generally decrease as n (the number of outfalls) increases from 2 to a certain value after which the costs increase. A complete description of the algorithm and its applications are presented. (Lowry-Texas)
W72-00047

CHARACTERISTICS OF EVAPORATION FROM INDUSTRIAL WASTES (OSOBENNOSTI ISPARENIYA S PROMYSHLENNYKH STOKOV),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
V. I. Kuznetsov.
In: Eksperimental'nyye Gidrologicheskiye issledovaniya na Valdaye; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 181, p 33-60, 1970. 9 fig, 11 tab, 7 ref, append.

Descriptors: *Evaporation, *Industrial wastes, *Waste water (Pollution), *Pollutant identification, Effluents, Water pollution sources, Liquid wastes, Solutes, Industrial water, Industrial plants, Fresh water, Water temperature, Films, Water vapor, Vapor pressure, Air temperature, Humidity, Wind velocity, Evaporation pans.
Identifiers: *USSR, Pollutants (Man-made), Transparency, Vapor tension, Mineralization.

Evaporation from industrial wastes and from variously colored fresh water was studied to develop procedures for calculating evaporation from transparent and strongly mineralized solutions and wastes produced by industries and to estimate the accuracy of these calculations. Three categories of pollutants were examined: (1) highly transparent industrial wastes, which are multicomponent solutions of highly concentrated mineral salts; (2) weakly mineralized industrial wastes, which have a complex chemical composition, a low transparency and a varying color; and (3) industrial wastes with surfaces covered by films of organic or surface-active substances. A working formula was derived for all three categories of industrial wastes. Data on the concentration of these wastes in the surface layer of liquids must be available to calculate evaporation from highly transparent industrial wastes. To calculate evaporation from weakly mineralized wastes it is necessary to know the temperature of the evaporating surface. To calculate evaporation from wastes with surface films, both of these characteristics must be known. A further study of evaporation from industrial wastes calls for defining the influence of these characteristics on evaporation and for developing methods to calculate them. (See also W72-00061) (Josefson-USGS)
W72-00063

EFFECT OF PRECIPITATION AND EVAPORATION ON CHANGES IN SOLUTION CONCENTRATION (VLIYANIYE DOZHDEY I ISPARENIYA NA IZMENENIYE KONTSENTRATSII RASTVOROV),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
V. S. Golubev.
In: Eksperimental'nyye gidrologicheskiye issledovaniya na Valdaye; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 181, p 61-76, 1970. 5 fig, 3 tab, 4 ref.

Descriptors: *Brines, *Waste dilution, *Precipitation (Atmospheric), *Evaporation, *Sampling, Industrial wastes, Evaporation pans, Sodium chloride, Vapor pressure, Density, Seasonal.
Identifiers: *USSR, Brine concentrations, Variation coefficient.

Observations of the concentration of sodium chloride solutions (industrial wastes) in 0.3-sq-m GGI-3,000 evaporation pans were conducted in May-October 1969 to calculate brine concentration in a surface layer as a function of precipitation and evaporation. Brine density was found to be most dynamic in the uppermost layer of the evaporation pans and generally increased with an increase in the sampling depth. Brine density in upper layers of the evaporation pans decreased during periods of rain and gradually increased after precipitation. When precipitation amounts were small (up to 10 mm) dilution was observed only in the upper 7-cm layer. A reduced concentration was observed in the 10-15-cm layer when precipitation was 10-20 mm and extended to a depth of 30 cm when precipitation exceeded 40 mm. Sampling must be confined to a surface layer no thicker than 1 cm to determine the coefficient of reduction of maximum vapor tension above the solutions in the evaporation pans. A total of 5-10 brine concentration measurements over a 10-day period are required for a reliable calculation of the average 10-day value of the coefficient. When measurements of brine concentration are limited to 2-3 samplings per season, sampling must include the entire depth of the pan. Brine concentration in the surface layer of brine pans and storage ponds must be considered to accurately determine evaporation from the surface of industrial wastes and brines on the basis of the formulas examined. (See also W72-00061) (Josefson-USGS)
W72-00064

INFILTRATION RATES AND GROUNDWATER QUALITY BENEATH CATTLE FEEDLOTS, TEXAS HIGH PLAINS,
Texas Tech Univ., Lubbock. Dept. of Geoscience.
William D. Miller.
Copy Available from GPO Sup Doc as SN 5501-0125, $0.65; Microfiche from NTIS as PB-203 681, $0.95. Environmental Protection Agency-Water Quality Office, Water Pollution Control Research Series Report, January 1971. 55 p, 26 fig, 11 tab, 6 ref. EPA Program 16060 EGS 01/71.

Descriptors: *Nitrates, *Groundwater, Water quality, *Infiltration, Soils, Drainage, Seepage, Runoff, Water pollution sources, Path of pollutants, Water analysis.
Identifiers: *Ogallala formation, *Core chemistry, Permeability, *Texas High Plains, Geologic environment, *Feedlot runoff.

Detailed field and laboratory studies of five feedlots were conducted to determine field seepage rates and distributive geometry of infiltrated runoff. Practical field seepage rates at these sites ranged from 2 to 20 feet/year. Dispersal rates of ions in the groundwater zone varied from 45 to 400 feet/year. Nitrogen (NO3, NO2, NH4, Org-N) and common chemical parameters (Ca, Mg, Na, K, Cl, SO4, TDS, pH, and conductance) were determined in cores and groundwater samples; based on groundwater analyses from 80 Texas High Plains feedlots, rates of concentration of NO3-N and Cl in groundwater beneath feedlots range from 0.07 to 0.4 p.p.m. per year, and average 0.17 p.p.m. per year. Laboratory determined constant head vertical permeability of cores from 22 feedlot sites revealed a range in values of .01 to .000001 cm/sec for Ogallala sediments, .0001 to 10 to the minus 7th power cm/sec for near-surface material of floodplains and feedpen-runoff surfaces, and values of .000001 to 10 to the minus 8th power cm/sec for playa clay. Factors related to runoff-infiltration were correlated with groundwater quality, and it was determined that local surficial material and regional soils patterns are closely related to quality of groundwater beneath feedlots. Direct correlation of water quality does not exist with feedpen-runoff slope, cattle load, and surface-area ratios of drainage basin to collection system.
W72-00083

MISSOURI STREAM STUDIES RELATING TO THE 'NEW LEAD BELT',
Missouri Univ., Rolla.
B. Wixson, and E. Bolter.
Proceedings, Mining Environmental Conference, University of Missouri-Rolla, April 16-18, 1969. p 9-20, 6 fig, 11 ref. OWRR B-021-MO (4).

Descriptors: *Water pollution sources, *Mine wastes, *Heavy metals, *Mining, *Missouri, Copper, Surface waters, Streams, Water quality, Chemical analysis, Mine water, Ecology, Fish, Pollutant identification.
Identifiers: *Lead mining (Mo), Zinc.

The recent development of one of the world's largest lead-zinc deposits in the Viburnum Trend or 'New Lead Belt' of South East Missouri is altering the presently non-industrialized and sparsely populated Ozark environment. The mining development is located in Reynolds and Iron Counties, approximately 70 miles southeast of Rolla, Missouri. Industrial population is limited to a north-south belt some 40 miles in length and the streams affected are in the Black River Basin and among some of the best water resources in Missouri. Heavy metal studies indicated that the range of values for copper, lead and zinc were from 1-20 ppb. The most frequently occurring values for all 3 elements were from 4-6 ppb. This parameter was used as the normal background. The values for copper, lead and zinc in the waters of the Bee Fork, below the point of confluence with mine and milling waste, show, on the average, an increase of 2-3 fold over background. The range of values in this part of the stream was from background to about 50 ppb. However the concentrations of heavy metals now present in the tailing discharges do not approach the limits of acute toxicity to fish or to present other stream pollution problems at this time. No significant changes in water quality were found for dissolved oxygen, alkalinity, hardness or stream temperature. (Woodard-USGS)
W72-00089

RESIDUES IN FISH, WILDLIFE, AND ESTUARIES,
National Marine Fisheries Service, Auke Bay, Alaska. Biological Lab.
H. S. Sears, and W. R. Meehan.
Pesticides Monitoring Journal, Vol 5, No 2, p 213-217, September 1971. 1 fig, 2 tab, 5 ref.

Descriptors: *Water pollution sources, *Herbicides, *Estuaries, *Environmental effects, *Alaska, Ecology, Ecosystems, Fish, Forestry, Clear-cutting, Vegetation, Control, Watershed management, Water quality, Data collections, Chemical analysis, Wildlife conservation, Aquatic insects, Aquatic life, Water quality control.
Identifiers: *Nakwasina River (Alaska).

On June 6 and 7, 1968, the U.S. Forest Service sprayed 2,4-D over the Nakwasina River drainage on Baranof Island in southeastern Alaska to control growth of red alder (Alnus rubra) in clearcut forest lands of Sitka spruce (Picea sitchensis) and western hemlock (Tsuga heterophylla). The objective of the spraying project was to promote growth of seedlings of spruce and hemlock by retarding growth of fast-growing broad-leaved plants. About 400 acres of cutover lands were treated with butyl 2,4-dichlorophenoxyacetate at the rate of 2 lb/acre acid equivalent. No immediate mortality to salmonid fishes or aquatic invertebrates was attributable to the spray. Samples of water and fish had concentrations of 2,4-D well below the level generally considered to be lethal to aquatic organisms. (Woodard-USGS)
W72-00122

A PROCEDURE FOR TRACING OF KRAFT MILL EFFLUENT FROM AN OCEAN OUTFALL BY CONSTITUENT FLUORESCENCE,
Pacific Northwest Water Lab., Corvallis, Oreg.
D. J. Baumgartner, M. H. Feldman, and C. L. Gibbons.
Water Research, Vol 5, No 8, p 533-544, August 1971. 16 fig, 12 ref.

Descriptors: *Water pollution sources, *Tracers, *Effluents, *Industrial wastes, *Oceans, Water pollution control, Tracking techniques, Path of pollutants, Fluorescence, Instrumentation, Wavelengths.
Identifiers: *Constituent fluorescence, *Paper mill wastes, Plume tracking.

Fluorescent spectra from four kraft mills' effluents demonstrate excitation and emission bands useful for tracing a waste discharge plume in the ocean. The band wavelengths and relative energy intensities were somewhat variable from mill to mill and can be variable over a period of time at each mill so that complete excitation and emission scans should be made with a laboratory instrument for each tracing study in order to choose the most effective wavelengths for excitation and emission. For the same reasons a response-dilution calibration curve should be made for each trial. The samples from Georgia-Pacific suggest the capability to trace their plume until diluted between 100 and 1000 times. The shorter excitation and emission wavelengths used (210 nm and 310 nm, respectively) were more useful (and more stable with time) than the longer wavelength peaks (350 nm and 450 nm, respectively). It does not appear necessary to correct for time decay of fluorescence during the time of travel in the plume or for the time lapse between sample collection and analysis, up to 48 h. (Woodard-USGS)

W72-00123

THE CHEMICAL STATES OF COPPER IN POLLUTED FRESH WATER AND A SCHEME OF ANALYSIS TO DIFFERENTIATE THEM,
Water Pollution Research Lab., Stevenage (England).
M. J. Stiff.
Water Research, Vol 5, No 8, p 585-599, August 1971. 2 fig, 6 tab, 15 ref.

Descriptors: *Water pollution sources, *Copper, *Surface waters, *Fresh water, *Water chemistry, Chemical reactions, Chemical properties, Toxicity, Fish, Copper compounds, Chemical degradation, Analytical techniques, Data collections, Organic compounds, Suspended load, Sediments, Chemical analysis, Hydrologic data.

Copper may be present in polluted surface fresh waters both associated with suspended solids and in different soluble chemical states. The most likely soluble forms of copper are its complexes with carbonate, cyanide, amino acids and polypeptides, and humic substances as well as the free cupric ion. An analytical scheme was devised to differentiate quantitatively these soluble forms of copper. Analytical results showed that much of the copper present in river water, was associated with suspended solids and that soluble copper consists almost entirely of complexed forms. (Woodard-USGS).
W72-00126

ACIDITY CONTROL IN BALD EAGLE CREEK AND WEST BRANCH SUSQUEHANNA RIVER, CLINTON COUNTY, PENNSYLVANIA.
Geological Survey, Harrisburg, Pa.
H. N. Flippo, Jr.
Geological Survey Open-File Report, February 1971. 28 p, 8 fig, 2 ref.

Descriptors: *Water analysis, *Water quality, *Acid mine water, *Regulated flow, *Water quality control, Streams, Fish, Acidity, Alkalinity, Pennsylvania, Streamflow, Water pollution control, Acidic water, Reservoirs, Water pollution sources.
Identifiers: *Bald Eagle Creek (Penn), *Susquehanna River (Clinton Co Penn).

Regression analysis of chemical and physical data collected on Beech Creek in Clinton County, Pennsylvania in two curves that relate the concentration of free hydrogen ion to the electrical specific conductance of the water. These curves provide a means of estimating, through use of data telemetered from a water-quality monitor on Beech Creek, the acid load in the stream at any time. These estimates of acid loads in Beech Creek enable the operators of Foster Joseph Sayers Dam on Bald Eagle Creek to release sufficient alkaline water from the reservoir to prevent fish kills in lower Bald Eagle Creek that could be caused by the acid from Beech Creek. The acid content of the West Branch Susquehanna River upstream from the city of Lock Haven usually exceeds the amount that can be neutralized by Bald Eagle Creek. However, inasmuch as the alkaline content of Bald Eagle Creek exceeds the amount required to effectively neutralize the acidity of Beech Creek, some water may be conserved in the reservoir for the purpose of improving the quality of the West Branch when the river is unusually acid. (Woodard-USGS)
W72-00128

PUBLIC PERCEPTION OF ENVIRONMENTAL QUALITY IN TUCSON, ARIZONA,
Arizona Univ., Tucson. Dept. of Geography; and University Coll., London (England).
For primary bibliographic entry see Field 05G.
W72-00174

RADIOACTIVE WASTE AND THE ENVIRONMENT,
George Washington Univ., Washington, D. C. National Law Center.
H. P. Green.
Natural Resources Journal, Vol 11, No 2, p 281-295, April 1971. 15 p, 52 ref.

Descriptors: *Radioactive wastes, *Hazards, *Environment, *Public rights, Radiation, Fallout, Radioactive waste disposal, Waste disposal, Air pollution, Industrial wastes, Radioactivity effects, Water pollution, Water pollution sources, Water pollution control, Thermal pollution, Regulation, Administration, Administrative agencies, Federal government, Jurisdiction, Radioactivity.

This article deals exclusively with radioactive wastes generated by the peaceful use of atomic energy, particularly those generated in connection with nuclear power plants. Radioactive wastes are placed into two general categories: (1) low-level wastes, which, it is believed, can safely be discharged into the biosphere; and (2) high level wastes which, because of their radioactive longevity, biological risks, and concentrations of radionuclides, must be perpetually isolated from the biosphere. The present methods for disposing of both types of radioactive wastes are considered, with special attention focused upon the potential harm that exists in each disposal method. Next, the systems of national legal controls are considered, with emphasis upon actions of the Atomic Energy Commission. The author puts forth two basic propositions in this area. First, atomic energy technology involves substantial benefits to our society. Second, the use of this technology generates wastes which, if discharged or disposed of in the biosphere, create some degree of risk. The article then considers in detail the system for balancing these two contrasting propositions and the effect of such balancing upon the future of mankind. (Horwitz-Florida)
W72-00193

EVALUATION OF DISPERSED POLLUTIONAL LOADS FROM URBAN AREAS,
Oklahoma Univ., Norman. Bureau of Water Resources Research.
Jerry G. Cleveland, George W. Reid, and Jim F. Harp.
Available from National Technical Information Service as PB-203 746, $3.00 in paper copy, $0.95 in microfiche. April, 1970. 213 p, 7 fig, 38 tab, 33 ref, 5 append. FWPCE Project 16090 DBX.

Descriptors: *Dispersion, *Land use, *Watersheds (Basins), Oklahoma, *Model studies, Path of pollutants, Water pollution sources, Human population, Cities, Municipal wastes, Statistical methods, *Correlation analysis, *Regression analysis, *Forecasting, Seasonal, Nutrients, Solid wastes, Bacteria.
Identifiers: *Tulsa (Oklai), *Pollution loads, *Pollution concentrations, *Urban runoff, Component analysis, Population density, Commercial density, Streets, Environmental index.

The objective was to develop a technique of evaluating the dispersed pollutional loads from urban runoff. The technique involved analytically determining several pollutant parameters from twelve separate drainage basins, and then correlating the pollution levels to land use practices. The study used the statistical tools of correlation coefficients, component analysis, and multiple regression analysis to develop predictor models for estimating urban dispersed pollutional concentrations and loads. Separate mathematical equations for estimating the expected seasonal bacterial, organic, nutrient, and solid concentrations from urban runoff were developed. The predictors used in the equations were common urban area variables, such as population, population density, commercial establshment density, percentage of streets, and environmental index. Twelve mixed land use drainage basins located in the City of Tulsa, Oklahoma, were used as the test areas. Detailed land use information was provided by the Tulsa Metropolitan Area Planning Commission's Land Activity File.
W72-00355

OCEAN OUTFALL DESIGN: PART I - LITERATURE REVIEW AND THEORETICAL DEVELOPMENT,
Pacific Northwest Water Lab., Corvallis, Oreg.
D. J. Baumgartner, and D. S. Trent.
Available from the National Technical Information Service as PB-203 749, $3.00 in paper copy, $0.95 in microfiche. Interim report, April 1970. 129 p, 26 fig, 2 tab, 61 ref. EPA Program 16070 DBH.

Descriptors: *Outlets, Oceans, Design criteria, *Water disposal, Estuaries, Coasts, Water pollution sources, Waste treatment, *Reviews, Bibliographies, Discharge (Water).
Identifiers: *Ocean outfall design.

The growth of population and industry in the coastal regions of the country, along with increased use of coastal waters for disposal of wastes produced inland, presents the potential of new or increased pollution in a valuable national resource. In order to assure that marine water quality is maintained and enhanced for present and future water uses, each source of waste input must be evaluated for its impact on the environment. Treated wastes must be discharged in such a manner and location that the resulting concentrations and contact times do not violate the water quality requirements specified for the desired water uses. The disposal process can be designed within these constraints through a mix of at least four techniques: degree and type of waste treatment; site selection; outfall or barge distribution of wastes; barrier construction. This report presents a review of the literature pertinent to the theoretical development of present ocean outfall design technology as it applies to waste discharges in general. (Gruchalla-EPA)
W72-00356

INVESTIGATION OF TECHNIQUES TO PROVIDE ADVANCE WARNING OF GROUND--WATER POLLUTION HAZARDS WITH SPECIAL REFERENCE TO AQUIFERS IN GLACIAL OUTWASH,
Washington State Univ., Pullman. Water Research Center.
James W. Crosby, III, D. L. Johnstone, R. L. Fenton, C. H. Drake, and W. J. Purves.
Available from the National Technical Information Service as PB-203 748, $3.00 in paper copy, $0.95 in microfiche. Final report, August 1971. 148 p, 48 fig, 19 tab, 104 ref, 2 append. OWRR B-005-WASH (5).

Descriptors: Groundwater, *Water pollution, *Septic tanks, *Soil disposal fields, Aquifers, Soil moisture, Pollutant identification, Washington, Glacial soils, Sands, Gravels, Clays, Infiltration, Water pollution sources.
Identifiers: *Spokane Valley (Wash), *Groundwater pollution, *Glaciofluvial material, Spokane (Wash), Glacial outwash.

Findings are recorded of a six-year investigation of pollution hazards involved with the use of septic tanks and drainfields in the Spokane Valley of eastern Washington. The geological setting of the study area was investigated by gravimetric and refraction seismic methods. The results of these studies indicated a generally simple, U-shaped valley incised in ancient granitic and metamorphic rocks. Valley fill materials appear to be almost entirely glaciofluvial sands and gravels. Previously postulated basalt flows and Latah clays are probably not present in significant amounts. Drilling and sampling of local drainfields revealed that the upper moist and wet valley fill materials pass into dry sands and gravels at depth. This phenomenon prompted a postulate that drainfield fluids must be moving laterally rather than vertically. Confirmatory laboratory measurements of soil moisture tension showed all of the soils, at depth, to be in a state of high moisture deficiency. Routine geophysical logging of monitor wells indicated that moisture movement and variations were confined to upper soil layers. Infiltration tests substantiated other findings concerning the movement of soil moisture. Extensive sampling and analysis of surface and ground waters

revealed no evidence of ground-water contamination. Surface waters are generally of good quality east of Spokane but are seriously degraded in the immediate Spokane area.
W72-00358

HAZARDS OF MERCURY, SPECIAL REPORT TO THE SECRETARY'S PESTICIDE ADVISORY COMMITTEE, DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE.

Environmental Research, Volume 4, 1971, p 1-69. Earlier version abstracted as W71-04558, Vol 4, No 9, May 1, 1971.

Descriptors: *Water pollution effects, *Path of pollutants, *Hazards, *Poisons, *Heavy metals, Water quality, Water pollution sources, Public health, Chemical wastes, Organic compounds, Safety, Monitoring, Human pathology.
Identifiers: *Mercury, *Methylmercury.

The problem of mercury contamination in the United States is potentially grave. The problem has been under intensive study for some years in Sweden and Finland where the patterns of usage of mercury are similar to those in the United States. The present situation stems from the extensive recent increase in the industrial and agricultural uses of mercury. Methylmercury is concentrated several thousand times in fish and shellfish, partly through contamination of their food and partly through its presence in the water. The relative ease with which methylmercury passes the 'blood-brain barrier' accounts for severe neurologic manifestations. The sources of mercury contamination, which caused a recent poisoning disaster in Minamata Bay and Niigata, Japan, were discharges from plants using mercury catalysts in the manufacture of vinyl chloride and acetaldehyde. Methylmercury was preformed in the effluent of these factories. This report is an assessment of hazards of mercury as of mid-1970. It contains many specific recommendations aimed at better understanding and solution of the mercury problem in the United States. (Knapp-USGS)
W72-00374

ENVIRONMENTAL CONTROL OF GROWTH AND DIFFERENTIATION IN MULTICELLULAR PHOTOSYNTHETICS,
Washington Univ., St. Louis, Mo.
H. Wayne Nichols.
Available from the National Technical Information Service as AD-725 497, $3.00 in paper copy, $0.95 in microfiche. Final report Nov 17, 1970. 6 p. ONR grant NR 104-801.

Descriptors: *Algae, *Ecology, Environment, Photoperiodism, Growth rates, Temperature, Biochemistry, Physiology, Light.
Identifiers: Photosensitivity.

A summary is given of a research project which concerned itself with basic development and behavioral aspects of unicellular and multicellular red algae. Various physiological and biochemical characteristics of the algae have been studied, and techniques for control of certain developmental aspects of the organisms in the laboratory have been developed. To date the research has basically involved physical aspects of the environment. However, it is now clearly evident that chemical events occurring within the differntiating cellular systems must be studied and related to such physical control mechanisms as photoperiodicity, temperature and light quality.
W72-00377

INTERSTATE WATER POLLUTION CONTROL.
For primary bibliographic entry see Field 06E.
W72-00397

INDUSTRIAL EFFLUENTS OF THE NORTHWEST,
Cornell, Howland, Hayes, Merryfield/Hill, Corvallis, Oreg.
For primary bibliographic entry see Field 05G.
W72-00427

WHAT IS POLLUTION,
For primary bibliographic entry see Field 05G.
W72-00462

WASHINGTON (ANALYSIS OF STATE WATER POLLUTION LAW AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE LAW),
For primary bibliographic entry see Field 06E.
W72-00514

TRITIUM IN SURFACE WATER NETWORK JANUARY-JUNE 1970.
US Public Health Serv.

Radiol Health Data Rep. 11 (11): 1970. 638-639. Copyright 1971, Biological Abstracts, Inc.
Identifiers: Counter, January-June, Liquid, Monitoring, Network, Rivers, Scintillation, Surface, Tritium, USA, Water.
W72-00521

RADIOACTIVITY IN AIRBORNE PARTICULATES AND PRECIPITATION.
US Public Health Serv.

Radiol Health Data Rep. 11 (11): 1970. 641-649. Copyright 1971, Biological Abstracts, Inc.
Identifiers: Airborne, Particulates, Precipitation, Radioactivity, USA.
W72-00522

5C. Effects of Pollution

RESIDUES IN FISH, WILDLIFE, AND ESTUARIES,
National Marine Fisheries Service, Auke Bay, Alaska. Biological Lab.
For primary bibliographic entry see Field 05B.
W72-00122

CHEMICAL AND BIOLOGICAL CONDITIONS IN BALD EAGLE CREEK AND PROGNOSIS OF TROPHIC CHARACTERISTICS OF FOSTER JOSEPH SAYERS RESERVOIR, CENTRE COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, Pa., Water Resources Div.
H. N. Flippo, Jr.
Geological Survey Open-file Report, December 1970. 48 p, 2 fig, 5 tab, 21 ref, append.

Descriptors: *Reservoirs, *Impaired water quality, *Nutrients, *Post-impoundment, Thermal stratification, Chemical stratification, Bioindicators, Aquatic plants, Soil chemical properties, Reservoir silting, Pennsylvania.
Identifiers: *Foster Sayers Reservoir (Penn), Bald Eagle Creek, Centre County.

Foster Joseph Sayers Reservoir will be impounded on moderately fertile soils; however, its water source, Bald Eagle Creek, is a bicarbonate-water stream that is overly-enriched with nutrients. About 650 of the 1,730 acres to be inundated in summer are subject to infestation with aquatic weeds. Nuisance algal 'blooms' are expected to occur in summer. The reservoir will stratify in early summer and water released for conservation purposes and acid neutralization will consist mostly of hypolimnetic water. This water will be nearly depleted in dissolved oxygen and will, at times, contain relatively high concentrations of heavy metallic ions and hydrogen sulfide. (Flippo-USGS)
W72-00129

A COMPARATIVE ASSESSMENT OF POLLUTION'S EFFECT ON THE BENTHIC MACROINVERTEBRATES OF THE MILLERS RIVER, MASSACHUSETTS USING FACTOR ANALYSIS, DIVERSITY, INDICES AND CLUSTER ANALYSIS OF SIMILARITY COEFFICIENTS,
Massachusetts Univ., Amherst.
P. J. Godfrey.
M. S. Thesis, September 1970. 102 p, 12 fig, 13 tab, 62 ref.

Descriptors: *Water pollution effects, *Statistical methods, *Animal groupings, Massachusetts, Pollutants, Aquatic environment, Environmental sanitation, Physiological ecology, Stream fisheries, Invertebrates, Resistance, Animal diseases.
Identifiers: *Species diversity, Factor analysis, Cluster analysis, Diversity indices, Macroinvertebrates.

The Millers River in Massachusetts was studied to determine the effect of pollution on the benthic macroinvertebrates and to assess three analytical methods for describing the lotic-water communities: cluster analysis of similarity coefficients, diversity indices and factor analysis. All stations below the major source of pollution exhibit lower diversity and fewer numbers of species than upstream stations. Their fauna are also predominantly pollution tolerant. Populations at the several staions varied according to the type of pollutant present. Of the three analytical techniques, factor analysis, by recognizing trends in the variation in the number, relative abundances and kinds of species, is most effective in describing invertebrate communities and suggesting casual relationships. Cluster analysis of similarity coefficients provides a qualitative rough approach that produced results similar to those of factor analysis. Diversity indices, which combine the components of species richness and relative abundance, tend to be masked by opposing changes in these components. (LeGore-Washington)
W72-00136

INFLUENCE OF SEVERAL SPECIES OF AQUATIC PLANTS ON DICHLOBENIL RESIDUES IN WATER,
Virginia Polytechnic Inst. and State Univ., Blacksburg.
R. W. Schumacher.
M. S. Thesis, July 1971. 62 p, 7 fig, 14 tab, 56 ref. OWRR A-033-VA (1).

Descriptors: *Chemcontrol, *Herbicides, *2-6-dichlobenil, *Pesticide kinetics, *Pesticide removal, *Plant physiology, Chlorinated hydrocarbon pesticides, Organic pesticides, Pesticide toxicity, Persistence, Pesticide residues, Path of pollutants, Absorption, Translocation, Rates of application.
Identifiers: Herbicide kinetics.

Four species of aquatic plants (Elodea canadensis, Myriophyllum, M. brasiliense, and Eichornia crassipes) were evaluated for their effectiveness in removing 2,6-dichlorobenzonitrile (dichlobenil) from water. Emersed plants seem more resistant to the compound than submersed species. Dichlobenil doses having little or no effect on plant growth were applied and the kinetics of its removal from the system were followed using gas chromatographic techniques. The submersed species removed about 17% of the dichlobenil from the water in 6 hr, and the emersed species removed about 30% within 24 hr. There was little subsequent net uptake. The herbicide is metabolized of liberated into the air by the plants. Dichlobenil was applied to a farm pond at a concentration of 200 ug/l. After 8 days, this level was reduced by 50%, and after 64 days the concentration was below 10 ug/l. (LeGore-Washington)
W72-00137

GENERAL STUDIES ON TREMATODES IN THAILAND: CLASSIFICATION OF CERCERIAE IN THAILAND,
Mahidol Univ., Bangkok (Thailand). Faculty of Tropical Medicine.

R. A. M. Brandt.
Available from the National Technical Information Service as AD-726 035, $3.00 in paper copy, $0.95 in microfiche. Annual Report, No 2 (FE-443-2), February 1971. 230 p. Army DA-CRD-AFE-S92-544-70-G-163.

Descriptors: *Animal parasites, *Public health, *Trematodes, *Systematics, *Classification, *Mollusks, Diseases, Aquatic animals, Intermediate hosts, Life cycles.
Identifiers: *Thailand, *Mekong Valley, *Shellfish sanitation, Laos, Identification, Human food.

An extensive collection of molluscan species found in Thailand was examined for occurrence of parasitic trematodes. As several of these mollusks are utilized for food, many of the trematodes are of public health significance. The report is a catalogue of the molluscan species studied, and includes taxonomic keys for their identification. Descriptions of each species, of its distribution, and of its habitats are accompanied by a list of trematodes found associated with it. (LeGore-Washington)
W72-00138

BIOLOGICAL INVESTIGATION OF ATLANTIC TOMCOD, MICROGADUS TOMCOD (WALBAUM), IN THE WEWEANTIC RIVER ESTUARY, MASSACHUSETTS, 1967,
Massachusetts Univ., Amherst.
A. B. Howe.
M. S. Thesis, June 1971. 82 p, 14 fig, 10 tab, 112 ref, 2 append. OWRR A-002-MASS (4).

Descriptors: *Fish populations, *Life history studies, *Life cycles, Fish eggs, Fish management, Fish physiology, Larvae, Fish behavior, Natural resources, Ecology, Growth stages, Fisheries, Aquatic populations.
Identifiers: *Tomcod, *Atlantic tomcod, Base-line data, Cod, Natural history.

Age and growth, the life history, and the ecology of the Atlantic tomcod (Microgadus tomcod) were studied. Data were analyzed from 1,242 specimens from the Weweantic River estuary, Massachusetts. Scale and otolith annuli were determined to be valid indicators of age. The major period of annual growth is January - March to July. Young-of-the-year fish attained a mean size of 90 mm by September. Body length, back-calculated from scale relationships, showed average total lengths at formation of thefirst, second and third annuli to be 127, 196, and 270 mm respectively. Growth compensation was evident. The length-weight relationship is: log W — -5.1087 .. 3.0302 log L (r — 0/995). Diet studies indicated that shrimp, primarily Crangon septemspinosus, and amphipods were most frequently eaten. The seasonal occurrence and distribution of larval, young-of-the-year, and adults are described and related to environmental parameters. Eelgrass, Zosteria marina, was of major importance in tomcod ecology. Life history information is summarized. (LeGore-Washington)
W72-00139

THE AUTOMATIC DETECTION OF LOW LEVELS OF DISSOLVED FREE CHLORINE IN FISH FARMING EXPERIMENTS USING SEA-WATER EFFLUENTS,
White Fish Authority, West Kilbride (Scotland). Marine Fish Cultivation Unit.
R. M. Page-Jones.
The Progressive Fish Culturist, Vol 33, No 2, p 99-102, April 1971. 2 fig.

Descriptors: *Chlorine, *Monitoring, *Warming systems, Chlorination, Aquiculture, Sampling, Water pollution, Pollutant identification, Pollutants, Assay, Colorimetry, Analytical techniques, Water analysis, Water quality.

Aquiculture in seawater-cooled power stations entails the risk of high levels of chlorine, used for control of fouling organisms. An automatic instrument was constructed to give a clear indication of the level of dissolved chlorine in the form of green, amber, and red lights, representing low, high, and alarm (0.3 ppm) levels. A photoelectric colorimetry system, based on the well known D.P.D. method of chlorine determination, was used. Water from the effluent supply is fed to a mixing chamber where the reagents are injected at the required time. After a short interval, the colored sample is transferred to a sample cell through which green light passes, to fall on a suitably fixed photoelectric cell. The intensity of the light is a measure of the amount of dissolved chlorine present. The apparatus is described in detail. (LeGore-Washington)
W72-00141

SURVIVAL AND HATCHING OF WALLEYE EGGS AT VARIOUS DISSOLVED OXYGEN LEVELS,
Minnesota Univ., St. Paul. Dept. of Entomology, Fisheries, and Wildlife.
D. M. Oseid, and L. L. Smith, Jr.
The Progressive Fish Culturist, Vol 33, No 2, p 81-85, April 1971. 2 fig, 3 tab, 4 ref.

Descriptors: *Dissolved oxygen, *Oxygen requirements, *Walleye, *Fish eggs, *Hatching, *Water temperature, Oxygen, Water pollution effects, Fish physiology, Fry, Lethal limit, Bioassay, Physiological ecology, Fish conservation, Fish management, Limiting factors, Fish reproduction.
Identifiers: Survival, Species survival.

It is apparent from the reaction of walleye eggs to incubation at different oxygen levels that hatching time is substantially extended and mean length is smaller at lower levels. When length of the hatching period is extended by the subjection of eggs to low temperatures, the differences in length at different oxygen levels become greater. The differences in survival rates at different oxygen levels are also greater when temperatures during the incubation period are lower. The ecological significance of hatching after a longer time and at a shorter length in low oxygen concentrations can only be surmised from the available data. If shorter incubation periods and larger size at hatching time are considered to be advantageous to placing larger year classes in a natural system, optimum oxygen levels for the incubation of walleye eggs appear to be not lower than 5 to 6 p.p.m.
W72-00142

TOXICITY OF CERTAIN CHEMICALS TO JUVENILE POMPANO,
Louisiana State Univ., Baton Rouge. School of Forestry and Wildlife Management.
C. L. Birdsong, and J. W. Avault, Jr.
The Progressive Fish Culturist, Vol 33, No 2, p 76-80, April 1971. 3 tab, 10 ref.

Descriptors: *Aquiculture, *Chemcontrol, *Bioassay, *Fish diseases, *Lethal limit, *Fish farming, *Copper sulfate, *Potassium compounds, Salinity, Fish behavior, Aquatic environment, Fish control agents, Fish hatcheries, Fish management, Fish physiology, Toxicity, Fry, Fish parasites, Pest control, Juvenile fishes.
Identifiers: *Pompano, *Trachinotus sp., *Acriflavin, *Formaldehyde, Synergism, Antagonism.

The toxicity was determined of salinity on this toxicity. Test fish were challanged in static bioassay with acriflavin, copper sulfate, formalin, and potassium permanganate at salinities of 10, 20, and 30 ppt. Pompano were more resistant to acriflavin, copper sulfate, and formalin than are many freshwater fish, but were more susceptible to potassium permanganate. Toxicity of acriflavin and formalin appeared unaffected by salinity. The toxicity of copper sulfate decreased as salinity increased, while the toxicity of potassium permanganate increased as salinity increased. From these tests it appears that pompano can be treated with many of the same chemicals used in freshwater pond culture. (LeGore-Washington)
W72-00143

THE INFLUENCE OF OXYGEN CONCENTRATION ON ROUTINE METABOLISM OF CYPRINUS CARPIO L. IN DIFFERENT TEMPERATURE CONDITIONS, (INFLUENTA CONCENTRATIEI DE OXIGEN ASUPRA METABOLISMULUI ENERGETIC LA CYPRINUS CARPIO L. IN DIFERITE CONDITII DE TEMPERATURA),
Academia R.S.R., Bucharest (Rumania). Institutul de Biologie.
E. Leonte, GH. Burlacu, and AL. G. Marinescu.
Buletinul de Cercetari Piscicole, Vol 29 (4): p 5-12, 1970. 2 fig, 1 tab, 17 ref, English summary.

Descriptors: *Fish physiology, *Oxygen demand, *Oxygen requirements, *Water temperature, *Thermal stress, *Carp, Respiration, Oxygen, Environmental effects, Aquatic environment, Water quality.
Identifiers: Base-line data, Temperature effects, Cyprinus sp.

The combined effects of temperature and oxygen concentration on routine metabolism of carp (Cyprinus carpio) were studied. Experiments were carried out at 5, 10, 15, 20, 25 and 30 deg C; the region of respiration non-dependent upon oxygen concentration, for each temperature, was measured. There is a progressive increase in rate of oxygen Q ml 02/kg/h—4.08 T to the 0.861 power, in the region of respiration independent of the oxygen concentration. With increasing temperature, the critical concentration of oxygen shifts to higher values. The experimental data indicate that the oxygen concentration is of the greatest importance in the relation between routine metabolism, oxygen concentration and temperature, when temperature is ranging between 5 and 25 deg C. At 30 deg C, temperature acts directly upon respiration, and the metabolic rate declines although the oxygen concentration may be sufficiently high. (LeGore-Washington)
W72-00144

COMPARATIVE STUDY OF THE OXYGEN CONSUMPTION IN CTENOPHARYNGODON IDELLA AND HYPOPHTHALMICHTHYS MOLITRIX EMBRYOS AND LARVAE - FIRST STAGES, (CERCETARI ASUPRA METABOLIMULUI ENERGETIC LA SPECIILE CTENOPHARYNGODON IDELLA SI HYPOPHTHALMICHTHYS MOLITRIX IN STADIILE EMBRIONARE SI IN PRIMELE STADII LARVARE),
Academia R.P.R., Bucharest (Rumania). Institutul de Biologie.
E. Leonte.
Buletinul Institutului de Cercetari si Proiectari Piscicole, Vol 28 (4): p 33-40, 1969. 2 fig, 1 tab, 14 ref, English summary.

Descriptors: *Fish physiology, *Oxygen demand, Oxygen requirements, Respiration, Oxygen, Environmental effects, Growth stages, Larvae, Embryonic growth stage.
Identifiers: Base-line data.

Base-line data concerning oxygen consumption of embryonic and larval stages of the phytophagous fish, (Ctenopharyngodon idella and Hypophthalmichthys molitrix) were determined. Oxygen demand generally increased as development progressed. (LeGore-Washington)
W72-00145

ATLANTIC OCEAN POLLUTION AND BIOTA OBSERVED BY THE 'RA' EXPEDITIONS,
Kon-Tiki Museum, Oslo (Norway); and Colla Micheri, Laigueglia (Italy).
T. Heyerdahl.
Biological Conservation, Vol 3, No 3, p 164-167, April 1971. 1 fig, 2 ref.

Descriptors: *Oil wastes, *International waters, *Atlantic Ocean, Oil, Water pollution, Water pollution effects, Oceans (Sea water), Asphalt, On-site data collection, Oily water.
Identifiers: *Ra, Ship wastes, Oil pollution.

On two voyages virtually across the Atlantic Ocean in papyrus raft-ships in 1969 and 1970, surface pollution was observed from very close quarters. Visible pollution was recorded during six days of the eight weeks' sailing in 1969 and on forty of the first forty-three days of sailing in 1970, although the remainder of that voyage was in relatively clean water. The pollution was mainly in the form of floating asphalt-like material, mostly in tiny lumps but sometimes up to fist size, though other forms were also observed. The older lumps were often beset with living barnacles and Algae, while quantities of dead coelenterates were in some places observed floating among them. Observations were not quantitative, but attention is directed to the pollution of the Atlantic Ocean - an international dumping ground. (LeGore-Washington)
W72-00147

EFFECTS OF COPPER ON GAMMARUS PSEUDOLIMNAEUS, PHYSA INTEGRA, AND CAMPELOMA DECISUM IN SOFT WATER,
Federal Water Pollution Control Administration, Duluth, Minn. National Water Quality Lab.
J. W. Arthur, and E. N. Leonard.
Journal Fisheries Research Board of Canada, Vol 27, No 7, p 1277-1283, 1970. 5 tab, 12 ref.

Descriptors: *Water pollution effects, *Amphipods, *Gastropods, *Snails, *Copper, *Lethal limit, Mollusks, Metals, Copper compounds, Inorganic compounds, Bioassay, Resistance.
Identifiers: Physa sp, Campeloma sp., Chronic exposure, Acute exposure, Survival.

Three invertebrate species were subjected to acute (96-hr), followed by long-term (6-week) copper exposures under continuous-flow bioassay conditions. Survival, growth, reproduction, and feeding were the responses used for measuring toxicant effects. The average 96-hr median tolerance limits (TLm) values for Campeloma decisum, Physa integra, and Gammarus pseudolimnaeus were 1.7, 0.039, and 0.020 mg/liter total copper, respectively. The total copper concentration having no effect after 6 weeks exposure for all three species was between 8.0 and 14.8 microgram/liter. The newly hatched amphipods obtained from the second 6-week study were exposed to copper for 9 additional weeks, and grew to the adult stage only in copper concentrations A4.6 microgram/liter. After 5-weeks exposure to a water system, survival of newly hatched Gammarus was markedly reduced when copper concentrations were between 12.9 and 6.2 microgram/liter. (LeGore-Washington)
W72-00148

THE IMPORTANCE OF AVOIDING CHEMICAL CONTAMINATION FOR A SUCCESSFUL CULTIVATION OF MARINE ORGANISMS,
Comitato Nazionale per l'Energia Nucleare, La Spezia (Italy). Laboratorio per lo Studio della Contaminazione Radioattiva del Mare.
M. Bernhard, and A. Zattera.
Helgolaender wissenschaftliche Meeresuntersuchung, Vol 20, p 655-675, 1970. 10 tab, 6 ref.

Descriptors: *Toxicity, *Lethal limit, *Laboratory equipment, *Sampling, Aquiculture, Bioassay, Mortality, Morbidity, Water pollution effects, Toxins, Cultures, Phytoplankton, Copepods, Larvae.
Identifiers: Sea urchins, Leptocylindrus sp., Chaetoceros sp., Coccolithus sp., Phaeodactylum sp., Prorocentrum sp., Euterpina sp., Arbacia sp.

Six species of phytoplankton, one species of copepod, and sea urchin larvae were challanged with 70 different materials, which are components of equipment and apparatus that come into contact with marine organisms under culture. Several plastics, net glue, several rubber types, detergents, paints, and filters were among the items tested. Results are presented in tabular form. Test results were used in designing culture apparatus in the laboratory, where such consideration has proved highly beneficial. (LeGore-Washington)
W72-00149

EFFECTS OF ZOOPLANKTON ON ALGAE IN WESTHAMPTON LAKE,
Richmond Univ., Va. Dept. of Biology.
John W. Bishop.
Available from the National Technical Information Service as PB-203 961, $3.00 in paper copy, $0.95 in microfiche. Virginia Polytechnic Institute, Water Resources Research Center Bulletin 43, 1971. 33 p, 17 fig, 8 tab, 22 ref. OWRR A-022-VA (2).

Descriptors: *Zooplankton, *Algae, *Photosynthesis, Rainfall, Diurnal, Fluctuations, Chlorophyta, Euglenophyta, Cyanophyta, Chrysophyta, Copepods, Crustaceans, Laboratory tests, Virginia.
Identifiers: Westhampton Lake (Va).

Assemblages of algae with different concentrations of zooplankters were kept in cylinders of polyethylene and flexiglass, suspended in the lake. Analyses of water and both groups of organisms were conducted inside and outside these aquariums. Rotifers exhibiting no consistent vertical migration decreased the daily photosynthesis of algae by 22%. Vertically migrating copepods and cladocerans exerted no significant effect on the photosynthesis. None of the animal groups influenced the photosynthetic efficiency of algae, their carbohydrate production per unit of chlorophyll. Photosynthesis and photosynthetic efficiency were increased several days after rainfall. (Wilde-Wisconsin)
W72-00150

MICROFUNGI IN THE WATER, MUD, AND LITTER OF A CATTAIL MARSH,
Wisconsin State Univ., Oshkosh. Dept. of Biology.
Leonard L. Tews.
International Association Great Lakes Research, Proceedings 13th Conference of Great Lakes Research, p 106-113, 1970. 1 fig, 4 tab, 33 ref. OWRR A-025-WIS (1).

Descriptors: *Fungi, *Water, *Mud, *Cattails, *Marshes, Wisconsin, Yeasts, Phytoplankton, Benthic flora, Lake Michigan, Great Lakes, Hydrogen ion concentration, Temperature, Systematics, Eutrophication, Sampling, Methodology, Molds, Degradation (Decomposition).
Identifiers: *Litter, Lake Butte des Morts (Wis), Allen Marsh (Wis), Trichoderma viride, Mucor hiemalis, Penicillium stipitatum, Hansenula saturnus.

The Fox-Wolf River System flows into Lake Michigan so that its health is directly related to the welfare of the Great Lakes. At its upper reaches the river drains farm lands, and its lower reaches flow through an area of heavy industry, a region of paper manufacture. It was formerly bordered with extensive cattail marsh communities but in recent years these lowland ecosystems have been disappearing for unknown reasons. These communities are beautiful, harbor wild life, and may serve in pollution abatement; they also contain microfungi, capable of degrading a wide variety of organic compounds. Microfungi roles could be several--symbionts, decomposer, parasites, and degraders of organic material in mud and water. Knowledge of the components of the microfungal flora is a first step. They were collected from water, litter, and mud of Allen Marsh bordering Lake Butte des Morts and taxonomic entities isolated. The most frequently isolated fungi were Trichoderma viride Pers ex Fries, Mucor hiemalis Wehmer, Penicillium stipitatum Thom, and Hansenula saturnus (Klocker) H and P Sydow. Measurements were made of pH, temperature, water depth, and water and organic content of the mud. (Jones-Wisconsin)
W72-00151

EFFECTS ON FRESHWATER MICROFAUNA,
L. D. Jensen.
Journal Water Pollution Control Federation, Vol 43, No 6, p 1190-1191, 1971. 3 ref.

Descriptors: *Pesticides, *Rotenone, *Toxicity, Zooplankton, Lakes, Crustaceans, Copepods, Herbicides, Daphnia, Bioassay, Rotenone, Heptachlor. Identifiers: Jasper National Park (Canada), Patricia Lake (Canada), Cladocerans.

Zooplankton communities of two mountain lakes in Jasper National Park, Canada, were reported. Studies of zooplankton distribution, predation, competition, and succession were reviewed in terms of rotenone effects. Adverse side effects of a single application of rotenone to a lake are likely to be minimal, especially in comparison with the detrimental effects of certain other fish-eradicating toxicants such as toxaphene or copper sulfate. Three years seemed to be the minimum time required for the zooplankton to recover in these two lakes to pre-rotenone levels of species diversity and abundance. Also toxicity of some herbicides to selected freshwater crustaceans was reviewed. Daphnia was generally the most sensitive animal to herbicides, followed in descending order of sensitivity by seed shrimp, grass shrimp, sowbug, scud, and crayfish. In a similar paper the response of selected zooplankters to heptachlor is given. Eight zooopankters tolerated 0.01 mg/l heptachlor for 168 hours. Gastrotrich and Brachionus were the most resistant tolerating up to 0.10 mg/l heptachlor under standard bioassay test conditions. Six other zooplankters were all killed by 0.10 mg/l heptachlor. (Jones-Wisconsin)
W72-00152

TOXICITY OF SELENIUM TO THE BLUE-GREEN ALGAE, ANACYSTIS NIDULANS AND ANABAENA VARIABILIS,
Udaipur Univ. (India). Dept. of Botany.
H. D. Kumar, and G. Prakash.
Annals of Botany, Vol 35, p 697-705, 1971. 5 fig, 12 ref.

Descriptors: *Toxicity, *Cyanophyta, Sulfur, Algae, Granules, Inhibition, Metabolism, Cultures, Environmental effects, Plant growth, Sulfate, Laboratory tests, Cytological studies.
Identifiers: *Selenium, *Anabaena variabilis, *Anacystis nidulans, Growth inhibition, Selenate, Selenite, Selenomethionine, Selenopurine, Antimetabolites.

Comparison was made of toxic effects of selenate, selenite, selenomethionine, and selenopurine on different growth phases of Anacystis nidulans and Anabaena variabilis in considering selenium toxicity. A protective role of sulfur against selenium toxicity was suggested as these compounds were less toxic in culture medium containing sulfate than in sulfur-free medium. Growth inhibitory effects of selenate and selenite were studied on algae grown on agar medium and in liquid mineral medium. Selenomethionine and selenopurine were studied only in liquid culture. Growth was estimated by measuring optical density of culture tubes and percent survival scored by colony counting. Dose-response curves of both algae suggest comparatively greater killing by selenite than by selenate. Anacystis nidulans is three times more tolerant to selenite and selenate killing than Anabaena variabilis. Selenite is more toxic in agar plate cultures and less toxic in liquid cultures than selenate. Cells grown in the highest growth-permitting concentration of selenite in liquid medium form a variable number of red granules. No such granulation occurs in cells treated with other seleno-compounds, indicating that the mode of selenite action in blue-green algae differs from that of other selenium compounds. (Jones-Wisconsin)
W72-00153

SOME ECOLOGICAL EFFECTS ON THE USE OF PARAQUAT FOR THE CONTROL OF WEEDS IN SMALL LAKES,
Nature Conservancy, Abbots Ripton (England). Monks Wood Experimental Station; and Imperial Chemical Industries Ltd., Jealott's Hill (England). Jealott's Hill Research Station; and Nottingham Univ. (England). Dept. of Botany.
For primary bibliographic entry see Field 04A.
W72-00155

PRELIMINARY INVESTIGATION OF THE LOW DISSOLVED OXYGEN CONCENTRATIONS THAT EXIST IN LONG LAKE LOCATED NEAR SPOKANE, WASHINGTON,
Washington State Water Pollution Control Commission, Olympia.
Richard K. Cunningham, and Roland E. Pine.
Technical Report No 69-1, 1969. 24 p, 7 fig, 5 tab, 8 ref, 2 append.

Descriptors: *Dissolved oxygen, *Analysis, *Anaerobic conditions, Municipal wastes, Sediments, Plankton, Sewage, Industrial wastes, Reservoirs, Methodology, Coliforms, Biochemical oxygen demand, Eutrophication, Water pollution control, Water pollution effects, Water pollution sources, Washington.
Identifiers: *Long Lake (Wash), Spokane River (Wash).

The critical deficiency of dissolved oxygen in the Long Lake, Washington, prompted analyses of water and sediments of the lake and waters of the inflowing Spokane and Little Spokane Rivers. The anaerobic conditions of the lake were correlated with decomposition of phytoplankton and the content of volatile solids in the lake bottom sediments. A part of the nutrient supply, stimulating the growth of algae, is released from the bottom sediments, and a part is provided via Spokane River by sewage and industrial refuse. Improvement of water quality of the lake would require a reduction of BOD, coliform, and nutrient discharges by industry and especially by the Spokane Sewage Treatment Plant. (Wilde-Wisconsin)
W72-00156

THE NUTRIENT CONTENT OF DRAINAGE WATER FROM AGRICULTURAL LAND,
Michigan State Univ., East Lansing. Dept. of Crop and Soil Sciences.
A. E. Erickson, and B. G. Ellis.
Michigan State Univ Agricultural Experiment Station Research Bulletin 31, 1971. 16 p, 15 fig, 5 tab, 4 ref.

Descriptors: *Nutrients, *Drainage water, *Fertilizers, *Leaching, Sampling, Soils, Sands, Methodology, Podzols, Nitrogen, Phosphorus, Nitrates, Phosphates, Potassium, Calcium, Magnesium, Michigan, Eutrophication, Agricultural chemicals.
Identifiers: Humic-Gley soils.

Need of concrete data concerning nutrient loss prompted this study to determine amounts of nitrogen, phosphorus, and some other nutrients in drainage waters from agricultural land. Seven sites in Michigan were sampled including water from Humic-Gley soils from the lake plain, sandy Podzolic soils from the potato-growing area, some small agricultural streams, Gray-Brown Podzolic soils, and the Podzol region. Sampling took place at least weekly except at the Muck Farm (sampled each day pumping occurred). Analysis was made for nitrate-nitrogen, orthophosphate-phosphorus, periodic determinations of calcium, magnesium, potassium and a few determinations or iron and zinc. Conclusions were that drainage waters from agricultural lands are remarkably low in nutrients considering the natural amounts in soil and those added by fertilizers. Phosphate was very low in drainage waters. Quantities were similar in magnitude to the equilibrium leachates for comparable soils. Nitrate-nitrogen was lost in the largest quantities of all nutrients. Considering the quantity of nitrogen in these soils and that 20 lb of nitrogen is fixed from the atmosphere per acre every year, all the drainage waters measured were below this value. Changes in nitrogen application will reduce nitrate losses. (Jones-Wisconsin)
W72-00157

NITROGEN CYCLE AND PRIMARY PRODUCTION IN MESOTROPHIC LAKE LUCERNE (HORWER BAY) AND IN EUTROPHIC RED LAKE WITH SPECIAL REGARD TO NITRATES AS LIMITING FACTORS (STICKSTOFF-KREISLAUF UND PRIMAPRODUKTION IM MESOTROPHEN VIER-WALDSTATTRSEE (HORWER BUCHT) UND IM EUTROPHEN ROTSEE, MIT BESONDERER BERUCKSICHTIGUNG DES NITRATS ALS LIMITIERENDEN FAKTORS),
Eidgenoessiche Anstalt fur Wasserversorgung, Abwasserreinigung and Gewaesserchurtz, Zurich (Switzerland).
Pius Stadelmann.
Schweizerische Zeitschrift fur Hydrologie, Vol 33, No 1, p 1-65, 1971. 22 fig, 35 tab, 81 ref, English summary.

Descriptors: *Eutrophication, *Productivity, *Analysis, Lakes, Temperature, Light, Chemical properties, Organic matter, Inorganic compounds, Sediments, Phosphorus, Acidity, Sulfides, Nitrogen, Primary productivity, Phytoplankton, Nitrogen fixation, Ammonification, Nitrification, Denitrification, Methodology, Nitrates, Oxygen, Water pollution effects, Water pollution control.
Identifiers: *Lake Lucerne (Switzerland), *Rotsee (Switzerland), Particulate matter, Limiting factors.

During 1969 and 1970 physical, chemical, and C-14 analyses were conducted in the mesotrophic Horwer Bay of Lake Lucerne and the highly eutrophic Red Lake (Rotsee). Particular attention was given to seasonal distribution of nitrogen oxides, particulate nitrogen, and soluble organic nitrogen in different layers of the lakes. Because epilimnic supply and external inflow of nitrogen were not sufficient to account for the primary production during the April to October stagnation period, a postulate was advanced of an intrabiocoenotic cycle regenerating nitrogen within the trophic layer. Fertilization with sodium nitrate, placed in plastic bags, failed to produce a significant increase in the rate of photosynthesis. The first step toward corrective measures is a reduction of the phosphorus supply in the trophogenic layers. (Wilde-Wisconsin)
W72-00158

THE USE OF RADIOACTIVE CARBON METHOD IN STUDIES OF TROPHIC RELATIONSHIPS OF PLANKTON (PRIMENENIE RADIOUGLERODNOGO METODA DLYA ISUCHENIYA TROFICHESKIKH VZAIMOOTNOSHENII V PLANKTONE),
Akademiya Nauk SSSR, Leningrad. Zoologicheskii Institut.
S. M. Vardapetyan, B. L. Gutelmacher, and N. G. Ozeretskovskaya.
Doklady Akademii Nauk SSSR, Vol 197, No 3, p 705-707, 1971. 1 fig, 2 tab, 5 ref.

Descriptors: *Analytical techniques, *Radioactivity techniques, *Plankton, Primary productivity, Food habits, Algae, Zooplankton, Carnivores, Daphnia.
Identifiers: Bosmina, Ceriodaphnia, Eudiaptomus.

Samples of plankton from two lakes were placed in 20 liter containers with lake water and C-14 as bicarbonate of sodium in concentration of 10 micro/liter. In intervals from 1 to 8 days, the radioactivity of phytoplankton was determined on 300 ml aliquots. The remainder was filtered through No 62 sieve. The retained zooplankton was fixed in formalin and distributed according to species. After 24 hours drying in a desiccator, the radioactivity of different species was determined. The results provided a picture of utilization of the primary production by Bosmina, Daphnia, Ceriodaphnia, and Eudiaptomus species. Results obtained with nutrition of predators were less well pronounced. (Wilde-Wisconsin)
W72-00161

GLOBAL ENVIRONMENTAL MONITORING,
Center for the Environment and Man Inc., Hartford, Conn.
George D. Robinson.
Technology Review, p 19-27, May 1971. 4 fig.

Descriptors: *Monitoring, *Environment, *Atmospheric pollution, Air pollution effects, Oceans, Air pollution, Estuaries, Data collections, Warning systems, Meteorology, Chlorinated hydrocarbon pesticides, Heavy metals, Carbon dioxide.
Identifiers: *Global monitoring, Global albedo, Baseline measurements, Atmospheric particles.

To recognize change, the undisturbed state or 'baseline' must be known and to implement remedial measures, mechanisms of the change must be understood. The critical global environmental problems are: biological effects of long-lived toxic chlorinated hydrocarbons, toxic heavy metals in assimilable form, environmental escape of nutrients; climatic effects of increasing atmospheric carbon dioxide, or particulate matter, of stratospheric contamination by aircraft, of petroleum escaped into environment; effects of physical and thermal changes at earth's surface. Physicists and biologists differ in appreciation of the problem relative to monitoring. Most atmospheric physicists agree that a man-made threat to the global climate cannot be monitored by climatic observations. Many biologists advocate creation of reserve areas biologically typical of various regions and detailed observations of their ecology. A strong case for study of global monitoring as a single integrated problem sponsored by some international body is given. New methods are needed for gathering and compiling global economic and statistical information; propagation of uniform data-collection standards; international physical, chemical, and ecological measurement standards administered through a monitoring center, and a study of scientific and political feasibility of integrating existing monitoring programs. (Jones-Wisconsin)
W72-00162

EUTROPHICATION,
Jack Foehrenbach.
Journal Water Pollution Control Federation, Vol 43, No 6, p 1191-1202, 1971. 75 ref.

Descriptors: *Water pollution control, *Water pollution sources, *Reviews, *Eutrophication, *Water pollution effects, Nitrogen, Phosphorus, Path of pollutants, Sewage treatment, Bottom sediments, Aquatic plants, Molybdenum, Carbon dioxide, Potassium, Light, Iron, Vitamins, Ecology, Nutrients.
Identifiers: Organic matter utilization, Nutrients removal, Algal blooms.

Literature on eutrophication, its causes, effects, and control is reviewed. Nutrients have several points of origin and many ways of being transported to waterways including varying amounts of nitrogen and phosphorus by precipitation, runoff, release from bottom sediments as well as leaching from vegetation and fertilizers. Oscillatoria mats transfer phosphates from sediments to water; eelgrass also transfers phosphates from bottom muds to water column. Cattle feedlots contribute phosphate due to poor engineering design. Nitrogen in soils originating from cattle urine and its path is described. Sanitary landfills can also be nutrient sources. Nitrogen is readily available for some species of blue-green algae in molecular nitrogen and its uptake was measured. Indications that molybdenum may be limiting were found. In highly mineralized lakes, the potassium concentration was critical. Physical factors also control algal blooms, exemplifying light energy in Lake Erken, Sweden, and the Menai Straits. Iron was found limiting to plant growth in Fern Lake. Several species of algae need vitamins or other organic growth factors. The concept of biological uptake of nutrients and subsequent harvesting of organisms is outlined in several papers. Literature on efficiency and costs of waste treatment technology is surveyed and cited. (Auen-Wisconsin)
W72-00165

POSSIBLE EFFECTS OF HUMAN ACTIVITY ON WORLD CLIMATE,
British Meteorological Office, Bracknell (England).

J. S. Sawyer.
Weather, Vol 26, No 6, p 251-262, June 1971. 4 fig, 28 ref.

Descriptors: *Weather modification, *Atmosphere, *Air pollution, *Air pollution effects, *Solar radiation, *Atmospheric pollution, *Nucleation, Climatic data, Albedo, Evaporation, Vegetation effects, Carbon dioxide, Water vapor, Precipitation (Atmospheric), Dusts, Condensation, Agriculture, Aircraft, Air temperature, Land development.

Some alarming statements have been made suggesting that substantial, or even catastrophic, changes in world-wide climate should be expected within a few decades if man's activities continue to expand along current lines. This article attempts to summarize the factors involved and to indicate some of the knowledge gaps which must be filled in order to achieve a realistic assessment of potential risks. Increases in water vapor in the lower stratosphere because of supersonic aircraft operation are not considered likely. Interference with ozone formation in the upper atmosphere by exotic chemicals from rocket exhausts is so far unsupported by any scientific data. Agricultural practices (deforestation in particular) may so affect ground surface properties, such as albedo, enough to alter evaporation, and ultimately, climate. While it is stressed that much research is necessary to evaluate this possibility, climatic alterations on other than a regional level are unlikely. Three other critical phenomena also warrant intense programs because of serious deficiencies in knowledge: (1) the effects of increased carbon dioxide in the atmosphere from burnt fuels, which may result in increased mean global temperature; (2) the direct effect of man-made dust in the atmosphere on light scattering and absorption, which could lower mean global temperature; (3) the effect of man-made pollution in providing nuclei for condensation and absorption of atmospheric water vapor, which may thereby alter precipitation regimes. It is felt that current information does not justify the most extreme views. (Casey-Arizona)
W72-00171

DYNAMICS OF THE NITROGEN CYCLE IN LAKES,
Alaska Univ., College. Inst. of Marine Science.
Vera Alexander.
Available from National Technical Information Service as PB-203 791, $3.00 in paper copy, $0.95 in microfiche. Final Report No. R71-7, March 1970. 207 p, append. EPA Program 16010 DDS.

Descriptors: *Nitrogen fixation, Nitrification, Alaska, *Demitrification, Lakes, Primary productivity, Nitrates, Ammoniac, *Nitrogen cycle, *Cyanophyta, Nutrients, Metabolism, Photosynthesis, Analytical techniques, Spectrophotometry.
Identifiers: *Algal populations, *Nitrogen metabolism, Nitrogen - 15, In-situ measurement, Carbon - 14 technique, Anoxic lake waters.

(1) The importance of nitrogen fixation by blue-green algal populations was established, and nitrogen-15 was introduced for measuring in situ nitrogen fixation rates in natural waters. (2) Nitrogen-15 techniques were developed for measuring nitrate and ammonia uptake, and the importance of ammonia as a nitrogen source in lakes became apparent. The rates of ammonia uptake correlated well with primary productivity as measured using the carbon-14 technique. (3) Denitrification rates were measured accurately in anoxic lake waters. (4) Rapid ammonia supply and turnover was demonstrated in lake waters. This implies that substantial nitrogen regeneration takes place constantly in surface waters of these lakes, and that this can provide a major nutient source for the photosynthetic population. Such ammonia supply is independent of any sediment interaction. (5) The limnological information available for interior Alaska has been expanded through this work, and there now exists a body of data which will prove invaluable for future work. (6) The Dumas method using a Coleman nitrogen analyzer were introduced for preparing nitrogen samples for mass spectrometry.
W72-00354

INTERNATIONAL ENVIRONMENTAL PROBLEMS--A TAXONOMY,
Resources for the Future, Inc., Washington, D.C.
C. S. Russell, and H. H. Landsberg.
Science, Vol 172, p 1307-1314, June 25, 1971. 32 ref.

Descriptors: *Pollutants, *Path of pollutants, *Pollution abatement, Environmental effects, International law, Social impact, Costs, Intangible costs, Intangible benefits.
Identifiers: *Taxonomy.

International environmental problems may be divided into two broad classes, physical-linkage effects and social-linkage effects. The first may be subdivided into global and regional effects, and the second into pecuniary and non-pecuniary effects. Global problems physically involve all or nearly all nations either as emitters or receptors and usually arise from the discharge of a persistent residual into a natural system that spreads the residual's effects over long distances. Oil spillage on the high seas represents a global problem. Regional problems arise from physical linkages between two or more nations with little global spillover because of the particular combinations of the pollutants and the natural systems involved. The Rhine, used by France and Germany as a sewer and by the Netherlands as a water supply, illustrates a regional problem. Social-linkage effects occur when the policies of one nation impinge directly on the economic or cultural well-being of other nations. For example, the efforts to rescue ancient Egyptian tombs from the encroachment of Lake Nasser arose from a nonpecuniary social-linkage effect. Solutions to these international problems may be either negotiated (by, say, the United Nations) or imposed (by, say, military force). (Settle-Wisconsin)
W72-00384

INTERSTATE WATER POLLUTION CONTROL.
For primary bibliographic entry see Field 06E.
W72-00397

SOME ASPECTS OF THE HYDROGRAPHY OF A RELATIVELY UNPOLLUTED ESTUARY IN SOUTHEASTERN MASSACHUSETTS,
Southeastern Massachusetts Technological Inst. North Dartmouth.
J. G. Hoff, D. A. McGill, and P. Barrow.
Proceedings, Industrial Waste Conference, 24th, May 6, 7, and 8, 1969, p 87-98. 4 fig, 3 tab, 14 ref.

Descriptors: *Estuaries, *Coasts, *Survey, Sampling, Data collection, Temperature, Dissolved oxygen, Phosphorus, Nitrogen, Salinity, Surface drainage, Massachusetts, Water pollution effects.
Identifiers: Baseline conditions, Buzzards Bay (Mass).

Our coastal estuaries have recently come into focus as environments that are vital to most of our Atlantic food and game fishes at some stage or stages in their life cycle. Many estuaries are currently undergoing rapid development. An opportunity to observe the conditions of a relatively unpolluted natural system provides a baseline for the study of its future changes. The subject area of this study is a small coastal estuary on the west side of Buzzards Bay, in southeastern Massachusetts. The principal stream is the Slocum River with its subsidiary coves and salt marshes. Measurements of temperature, salinity, dissolved oxygen, inorganic phosphate-phosphorus, and inorganic nitrate-nitrogen were made at five stations throughout the estuary and the lower reaches of the river over a period of two years. The estuary shows a seasonal variation in nutrients and oxygen which reflects the productivity cycles of estuarine systems in temperate regions. The lower regions of the estuary show nutrient levels in good agreement with observations in marine estuaries in the same vicinity. The lower river is apparently a marine-dominated system. Only the uppermost sections of the estuary give indications of influence from land drainage. (Goessling-Texas)
W72-00431

IMPACT OF STREAM ASSIMILATION CAPACITY ON WASTE TREATMENT REQUIREMENTS,
New York State Dept. of Health, Albany.
R. C. Mt. Pleasant, and I. Grossman.
Proceedings, Industrial Waste Conference, 24th, May 6, 7, and 8, 1969, p 227-237. 6 fig, 3 tab.

Descriptors: *Water quality control, Streams, *Self-purification, *Water utilization, Sewage treatment, Industrial waste, Analytical techniques, Methodology, Legislation, Sampling, *Waste assimilative capacity.
Identifiers: Discharge permits, Stream studies, Multiple water use.

The baseline for water quality management in New York State has been established by the legal adoption of classifications and quality standards for all waters. These standards acknowledge existence of multiple water usages and recognize best usages. Although waste assimilation is a water use, it is not the best water use. The concept of stream assimilation capacity plays a major role in determining the extent of waste treatment required based on an evaluation of the integrated influences of self-purification, stream usage and water quality standards. The Health Department has a philosophy of minimum secondary treatment (85% BOD removal and suspended solids plus disinfection) which is consistent with the water quality objectives of the State. Secondary treatment is required of all organic, industrial waste with appropriate credit for in-plant improvements. The mechanisms of stream assimilation are presented and discussed. Examples of industrial waste discharges are given and the approach taken in each case to arrive at a proper balance between water quality and water usage. Intensive stream studies are most helpful in determining the results of waste discharges and in providing an insight into the dominant mechanisms leading to these results. The inexactness of the science must be recognized and engineering judgement applied where necessary. (Goessling-Texas)
W72-00432

KINETIC AND STOICHIOMETRIC LIMITATIONS OF PHOSPHATE IN PURE AND MIXED BACTERIAL CULTURES,
Rice Univ., Houston, Tex.
D. J. Schaezler, A. W. Busch, and C. H. Ward.
Proceedings, Industrial Waste Conference, 24th, May 6, 7, and 8, 1969, p 507-533. 20 fig, 8 tab, 29 ref.

Descriptors: Water quality, *Eutrophication, *Phosphorus, Nutrient requirements, E coli, Growth, Laboratory tests, Kinetics, Optical properties, Effluents, Phosphates, Bacteria.
Identifiers: *Mixed bacterial cultures.

Phosphate limitation is one example of the general problem of nutrient limitation. Nutrient limitation is related to the bacterial growth kinetics. Small scale shake tube experiments with E. coli, M.L. 35 strain and mixed cultures derived from raw sewage were conducted to demonstrate the effects of phosphate concentration and growth kinetics. Glucose (G) was used as the substrate in these experiments. For E. coli, the stoichiometric limiting amounts of P is about 3.8 mg P/gm G with respect to glucose removal at the growth plateau and 4.9 mg P/gm G with respect to maximum cell mass production. For mixed cultures these figures are 5.4 mg P/gm G and 6.1 mg P/gm respectively. The kinetic limiting concentration of phosphorus was found to be zero. Therefore, the stoichiometric

limitation of phosphorous is more pertinent with respect to eutrophication of reservoirs. It is the total amount of phosphorus entering a reservoir that is important, not the percentage removal of phosphorus. (Goessling-Texas)
W72-00440

A QUANTITATIVE ARTIFICIAL SUBSTRATE SAMPLER FOR BENTHIC MACRO INVERTEBRATES,
G. Z. Jacobi.
Trans Amer Fish Soc. 100 (1): 1971. 136-138. Copyright 1971, Biological Abstracts, Inc.
Identifiers: Artificial, Benthic, Invertebrates, Macro, Quantitative, Sampler, Substrate.
W72-00528

DISSOLVED OXYGEN REQUIREMENTS OF FRESHWATER FISHES,
P. Doudoroff, and D. L. Shumway.
FAO (Food Agr Organ U N) Fish Tech Pap. 86, 1970. 1-291. Copyright 1971, Biological Abstracts, Inc.
Identifiers: Dissolved, Economic, Fishes, Fresh, Oxygen, Species, Technical, Water.
W72-00530

IMPACTS OF NUCLEAR POWER PLANTS ON THE ENVIRONMENT,
A. W. Eipper, C. A. Carlson, and L. S. Hamilton.
Living Wilderness. 34 (111): 1970. 5-12. Copyright 1971, Biological Abstracts, Inc.
Identifiers: Environment, Impacts, Nuclear, Plants, Pollution, Power, Thermal.
W72-00534

DEHYDRATION AND WATER INTOXICATION OF RANGE CATTLE,
T. C. Gray.
J Amer Vet Med Ass. 157 (11): 1970. 1549-1556. Copyright 1971, Biological Abstracts, Inc.
Identifiers: Cattle, Dehydration, Grass-M, Intoxication, Range, Water, Wheat.
W72-00536

EPOXIDATION OF ALDRIN BY A FRESHWATER OSTRACOD,
J. A. Kawatski, and J. C. Schmulback.
J Econ Entomol. 64 (1): 1971. 316-317. Copyright 1971, Biological Abstracts, Inc.
Identifiers: Aldrin, Chlamydotheca-Arcuata, Epoxidation, Food, Fresh, Insecticide, Ostracod, Toxicity, Water, Web.
W72-00548

EFFECT OF SOIL MOISTURE AND AERATION ON FUNGAL ACTIVITY, AN INTRODUCTION,
D. M. Griffin.
Toussoun, T. A., Robert V. Bega and Paul E. Nelson (Edited by). Root diseases and soil-borne pathogens. Symposium. 252 p, Illus. University of California Press: Berkeley, Calif., U.S.A. 1970. 77-80. Copyright 1971, Biological Abstracts, Inc.
Identifiers: Aeration, Bacterial, Chemical, Disease, Fungal, Incidence, Matrice, Mobility, Moisture, Osmosis, Physical, Root, Soil, Suction.
W72-00555

EFFECT OF SOIL WATER ON MICROBIAL GROWTH ANTAGONISM AND NUTRIENT AVAILABILITY IN RELATION TO SOIL-BORNE FUNGAL DISEASES OF PLANTS,
R. J. Cook, and R. I. Papendick.
Toussoun, T. A., Robert V. Bega and Paul E. Nelson (Edited By). Root Diseases and Soil-Borne Pathogens. Symposium. 252 p, Illus. University of California Press: Berkeley, Calif., U.S.A. 1970. 81-88. Copyright 1971, Biological Abstracts, Inc.
Identifiers: Antagonism, Diseases, Fungal, Growth, Microbial, Nutrient, Plants, Pressure, Relation, Soil, Soil-Borne, Suction, Water.
W72-00556

RESPONSES OF INTER TIDAL INVERTEBRATES TO LOW OXYGEN CONDITIONS,
G. P. Mangum, L. J. Kushins, and C. Sassaman.
Amer Zool. 10 (4): 1970. 516-517. Copyright 1971, Biological Abstracts, Inc.
Identifiers: Aerobic, Inter, Invertebrates, Low, Metabolism, Nassarius-Obsoletus, Oxygen, Tidal.
W72-00558

EFFECT OF ENVIRONMENTAL SALINITY ON THE INCORPORATION OF TRITIATED LEUCINE IN GILLS OF A FRESH WATER TELEOST XIPHOPHORUS-MACULATUS,
S. Holtzmann, and M. P. Schreibman.
Amer Zool. 10 (4): 1970. 518. Copyright 1971, Biological Abstracts, Inc.
Identifiers: Environmental, Fresh, Gills, Leucine, Salinity, Teleost, Tritiated, Water, Xiphophorus-Maculatus.
W72-00563

DDT INHIBITION OF INTESTINAL SALT AND WATER ABSORPTION IN TELEOSTS,
R. Janicki, and W. Kinter.
Amer Zool. 10 (4): 1970. 540-541. Copyright 1971, Biological Abstracts, Inc.
Identifiers: Adsorption, DDT, Inhibition, Intestinal, Marine, Pesticide, Salt, Teleosts, Water.
W72-00566

INTERFERENCE WITH A MEMORY PROCESS BY DDT IN GOLDFISH,
F. B. Davy, and H. Kleerekoper.
Amer Zool. 10 (4): 1970. 541. Copyright 1971, Biological Abstracts, Inc.
Identifiers: DDT, Goldfish, Interference, Memory, Process.
W72-00567

UPTAKE OF SULFUR-35 AMINO-ACIDS BY SYMBIOTIC ALGAE ZOOCHLORELLAE FROM THE FOOD OF GREEN HYDRA,
C. B. Cook.
Amer Zool. 10 (4): 1970. 544-545. Copyright 1971, Biological Abstracts, Inc.
Identifiers: Algae, Amino-acids, Artemia-Salina, Food, Green, Hydra, Sulfur-35, Symbiotic, Uptake, Zoochlorellae.
W72-00569

5D. Waste Treatment Processes

DEVELOPMENT OF A CHEMICAL DENITRIFICATION PROCESS,
North American Rockwell Corp., Canoga Park, Calif. Rocketdyne Research.
Frank C. Gunderloy, Jr., Ross I. Wagner, and Victor H. Dayan.
Copy available from GPO Sup Doc for SN-5501-0135 $0.65; microfiche from NTIS as PB-203 597, $0.95. Environmental Protection Agency--Water Quality Office, Water Pollution Control Research Series, October 1970, 63p, 5 fig, 26 tab, 27 ref. EPA Program 17010 EEX 10/70. Contract 14-12-546.

Descriptors: *Denitrification, *Chemical reactions, *Nitrate, Nitrogen, Hydrogen ion concentration, Catalysts, Copper, Phosphorus, Iron, Inhibitors, Separation techniques, *Waste water treatment.
Identifiers: *Chemical treatment.

Laboratory studies of a chemical dentrification process, namely copper catalyzed ferrous iron reduction of nitrate ion in basic media, demonstrated that denitrification of dilute (10 ppm NO3-N) nitrate ion solutions to a mixture of innocuous gaseous products was possible. 95 to 98% of the reduced nitrate was in the form of NH3, N2, N2O, NO2 and unreacted NO3. Optimum conditions for reaction were: (1) initial pH near 8 (mole ratio of OH (-)/Fe (....)— 1.5); (2) mole ratio Fe (....)/NO (-)3 —8; (3) concentration of catalyst 1-5 ppm Cu (....) with the reaction being carried out under anaerobic conditions; (4) Fe (....)ion derived from the sulfate; (5) NaOH used for pH adjustment; and (6) phosphate removed and carbonate content decreased. Preliminary investigation of reduction in a continuous flow system was encouraging. The by-product magnetite, was easily separated from the treated water in the absence of appreciable phosphate which inhibits its formation. Data from 280 experiments were tabulated. Cursory studies in potable water and secondary effluent indicate the presence of as yet unidentified inhibitory substances. (Lowry-Texas)
W72-00001

DEVELOPMENT OF IMMOBILIZED ENZYME SYSTEMS FOR ENHANCEMENT OF BIOLOGICAL WASTE TREATMENT PROCESSES,
Grumman Aerospace Cprp., Bethpage, N.Y.
Lawrence Slote.
Available from GPO Sup Doc for SN-5501-0113, $0.70; microfiche from NTIS as PB-203 598, $0.95. Environmental Protection Agency--Water Quality Office, Water Pollution Control Research Series, July 1970, 61 p, 11 fig, 9 tab, 30 ref. EPA Program 16050 DXN 07/70.

Descriptors: *Enzymes, *Activated sludge, *Distillations, Biodegradation, Bacteria, Separation techniques, Labatory tests, Chemical oxygen demand, Aeration, *Waste water treatment, *Biological treatment.
Identifiers: *Polymerization, *Immobilization, Deoxyribonucleic acid.

Degradation and utilization of wastewater nutrients by microbial action is controlled by a complex enzyme system. In attempts to produce a faster-acting system, a method was developed to biochemically fractionate the microbial enzymes from activated sludge, to concentrate and characterize their activity, and to immobilize this activity by entrapment in a polyacrylamide gel. The enzyme gel preparation was tested for its effect on the biological degradation of a bench-scale activated sludge process. Soluble enzymatic components were readily separated from particulate cell components, and the remaining soluble system was fractioned such that catabolic activity in the enzyme systems of interest was maintained while non-essential components were removed. Immobilization within the gel allowed activity to be maintained during repeated washings, exposure to substrate, and storage. Limited bench-scale tests produced no meaningful results possibly on account of either in complete polymerization of the gel, an improper activated sludge culture, or both. (Lowry-Texas)
W72-00002

BIO-REGENERATED ACTIVATED CARBON TREATMENT OF TEXTILE DYE WASTEWATERS,
FRAM Corp., East Providence, R.I.
Clarke A. Rodman, and Edward L. Shunney.
Available from the National Technical Information Service as PB-203 599, $3.00 in paper copy, $0.95 in microfiche. Environmental Protection Agency--Water Quality Office, Water Pollution Control Research Series, January 1971, 75 p, 24 fig, 20 tab, 5 ref. EPA Program 12090 DWM 01/71.

Descriptors: *Textiles, *Industrial wastes, *Color, Separation techniques, Adsorption, Activated carbon, Biodegradation, Chemical oxygen demand, Cost analysis, *Waste water treatment.
Identifiers: *Bio-regeneration, *Dye wastes, Regeneration.

A continual adsorption-biological regeneration cycle of the acivated carbon beds treating a dyehouse effluent has been achieved over a four-month period, resulting in a continuous decolorization and organic reduction. The textile dye wastes can be easily decolorized by a single pass flow through fixed granular activated carbon beds at an average flux of 12 gpm/sq ft, provided that the color bodies are receptive to carbon adsorption. The exhausted carbon can then be regenerated

biologically provided that the adsorbate is biodegradable. Biological regeneration provided an adsorption capacity in excess of 1.6 lbs COD per lb of carbon, in this instance. Color removal was virtually complete at two flow rates evaluated: 8.5 gpm/sq ft and 15.6 gpm/sq ft. COD removal was 85% or higher at the lower flow and only 48% at the higher flow. A 1.0 mgd plant was designed. For 50% COD removal estimates were $230,000 for construction and 8.3 cents/1000 gallons for operation. For 75% COD removal, the estimates were $550,000 and 23.1 cents/1000 gallons respectively. (Lowry-Texas)
W72-00003

HORIZONTAL HCL PICKLING LINE AT FUKUYAMA,
Nippon Kokan K. K., Fukuyama.
Y. Yazawa, T. Okamoto, and T. Chiyonobu.
Iron and Steel Engineer, September, 1969. p 120-124, 2 tab, 4 fig.

Descriptors: *Water quality control, *Steel, Industrial wastes, Legislation, Iron oxides, Waste water treatment, Water reuse, *Acids.
Identifiers: *Hydrogen chloride, *Regeneration, Fumes, Drag-out losses, Vent losses, Scrubber water, Pickling.

The fully integrated, iron and steel works of Nippon Kokan K.K. (Japan Steel and Tube Corp.) at Fukuyama began producing steel in August 1966, with steel strip as the primary product. Initial design analysis lead to selection of a horizontal pickling line using HCl and regenerating the spent acid in roasters. The operation of the pickle line and the regeneration plant has been satisfactory since its initial operation, producing high quality strip surface at the design speed of 600 fpm. Initially an inhibitor was used but was discontinued as no particular advantage could be seen. HCl losses at the pickle line consist of fume losses and drag-out losses into the rinse. HCl losses in the regeneration plant consist of HCl in the overhead from the absorber, which is removed in the scrubber water, the vent losses from the storage tanks and the chloride content in the oxide. HCl consumption for the past six months averaged 3.6 lbs. per ton of steel, that is 35% HCl (22 deg. Be). Acid loss on line are 10%. The efficiency of the regeneration plant is 94 to 96%. The pickling and regeneration facility represents a tangible contribution to the efforts of the steel industry throughout the world toward constantly raising the quality of steel products while reducing the pollution of the water resources they must rely upon. (Goessling-Texas)
W72-00004

TREATMENT OF REFINERY WASTES BY PHYSICO CHEMICAL PROCESSES,
Missouri Univ., Rolla.
Ju-Chang Huang, and Michael G. Hardie.
Journal of the Sanitary Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 97, No. SA 4, August 1971, p 467-478, 7 fig, 1 tab, 6 ref.

Descriptors: *Oil wastes, *Adsorption, *Coagulation, Activated carbon, Iron, Hydrogen ion concentration, Chemical oxygen demand, Turbidity, Nitrogen, Phosphorous, Industrial wastes, Cost analysis, Waste water treatment.
Identifiers: *Alum.

A refinery waste sample from the American Oil Company's Wood River Refinery Plant, Illinois, was obtained. The waste was slightly alkaline in nature, had a pH of 9, and COD and TOC of 296 mg/l and 74 mg/l respectively. The waste was high in suspended solids and turbidity, had an amber color, and .7 mg/l and 13.5 mg/l total phosphorous and total nitrogen as P and N. Although iron and alum coagulation results were very similar, the ferric chloride was chosen as the coagulant since alum requires closer pH control for consistency. Dosage if iron was 250 mg/l, and coagulation reduced COD from 296 mg/l to 75 mg/l, TOC from 74 to 20 mg/l, and orthophosphate from 0.7 to 0.2 mg/l. Concentrations of ammonia and total nitrogen were unaffected. The second stage of treatment was carbon adsorption, with various configurations being tested. A 3 ft carbon column was capable of producing an effluent of 3 mg/l TOC and turbidity of less than 1 JTU. Some organic leakage problems still remained however. Cost analyses have produced costs for comparble two-stage systems of 16 cents/1000 gallons, favorably comparable to the 11 cents/1000 gal. for conventional treatment. (Lowry-Texas)
W72-00005

KINETIC AANALYSIS OF DATA FROM BIOLOGICAL SYSTEMS,
Quirk, Lawler and Matusky, New York.
Robert L. Irvine, and Donald J. Schaezler.
Journal, Sanitary Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 97, No. SA 4, August 1971, p 409-424, 8 fig, 19 ref.

Descriptors: *Kinetics, *Design data, *Laboratory tests, Industrial wastes, Municipal wastes, Microorganisms, Flow rate, Dissolved oxygen, Biochemical oxygen demand, Activated sludge, Waste water treatment.
Identifiers: *Reaction rate coefficients, *Michaelis-Menten equation.

Despite the fact that biological waste treatment facility design is extremely sensitive to proper selection of the reaction rate coefficient, none of the municipal works and few of the industrial plants now in operation considered reaction kinetics during design. Although flow variability component distribution, and gross concentrations in the waste stream at the full scale level may obviate results obtained from intensive laboratory data investigations for exact kinetic formulations, a laboratory data generation procedure is presented which will assure that the reactor designed will do the required job. This procedure involves: (1) characterization of the waste by repetitive acclimation; (2) determination of reaction rates by measuring and analyzing waste concentration bod, toc, etc), organism concentration, and oxygen uptake rates in a batch reactor; (3) design of a continuous flow bench scale reactor; (4) after 1 to 4 weeks of operation of the C.F. bench reactor, remove a portion of the organisms and conduct batch reaction rate studies; and (5) design full scale unit on basis of reaction rate obtained in step 4. Care should then be exercised in selection of the correct operating scheme at the treatment plant to optimize efficiencies. Data from batch cultures fed glucose-mineral salts medium, domestic wastes, and domestic and industrial wastes are presented and analyzed as examples. (Lowry-Texas)
W72-00007

PHOSPHATE REMOVAL BY ACTIVATED SLUDGE,
Robert S. Kerr Water Research Center, Ada, Okla.
J. L. Witherow.
Proceedings, Industrial Waste Conference, 24th, May 6, 7, and 8, 1969. p 1169-1184, 8 fig, 5 tab, 15 ref.

Descriptors: *Waste water treatment, *Activated sludge, Municipal wastes, Dissolved oxygen, Biochemical oxygen demand, Data collection, Laboratory tests, Pilot plant, Sampling, *Phosphates.
Identifiers: Mixed liquor suspended solids, Detention time, Mass balance.

Unusually high phosphate removal has been reported by several activated sludge plants treating municipal (domestic-industrial) sewage. A total of 16 activated sludge systems were studied to determine the design and operating conditions that favored phosphate removal. Bench-scale batch studies and in one case a full scale plant study showed that phosphate removal could be enhanced by improved operating conditions. This field study indicates that the activated sludge process can, on a sustained basis, (average) 80% phosphate removal. Phosphate balances at five plants established that the wasted sludge was the vehicle for phosphate disposal. Phosphate reduction is accomplished in the aeration tank and not in the primary setting basin. Mixed liquor suspended solids concentration, DO, loading, detention time, and the amount of phosphates in the influent are the factors affecting removal. Phosphate reduction is maintained in the final clarifier by maximizing solid-liquid separation, minimizing anaerobic conditions, low SVI and high DO. Sludge reaeration and gravity sludge thickening can be incorporated in the phosphate removal-activated sludge process. The waste activated sludge releases its phosphate content under anaerobic conditions. Neither the waste activated sludge or its digested supernatant can be recycled without eliminating the phosphate disposal vehicle and destroying the phosphate removal process. (Goessling-Texas)
W72-00008

ANALYSIS OF FOOD PROCESSING WASTEWATERS,
Oregon State Univ., Corvallis. Dept. of Food Science and Technology.
Michael R. Soderquist.
Water Resources Research Institute Seminar WR-014.71, July 1971, p 7-21, 4 fig, 23 ref.

Descriptors: *Industrial wastes, *Systems analysis, *Dynamic programming, Public Health, Canneries, Feeds, *Water reuse, Waste water treatment, Water quality control.
Identifiers: *Food processing wastes, *By-product recovery, *Waste minimization.

Recent developments in the handling and disposal of food processing industry wastes have been largely concerned with waste reduction and by-product reclamation and re-use. However, the emphasis for the future will be directed more toward a unified systems approach. This approach will include research and developments in: (1) less wasteful harvesting methods; (2) in-field preprocessing (where applicable); (3) reduction of transportation damage; (4) increasing in-plant yield; (5) minimizing water usage; (6) development of new by-products; and (7) development of innovative treatment methods. An example of such a unified approach is presented for the paper industry. Assessment of environmental impact and cost in such an analysis is difficult at best, and usually is based on guidelines established by regulatory agencies, necessitating equitable treatment of all industries across political boundaries. Finally, the consumer must be convinced that the increased cost of goods and services is warranted for the cleaning-up of the environment. (Lowry-Texas)
W72-00011

THE CONCEPT OF WASTEWATER RECLAMATION,
Cornell, Howland, Hayes, and Merryfield/Hill, Corvallis, Oreg.
L. Gene Suhr.
Water Resources Research Institute Seminar, WR 014.71, July 1971, p 33-49, 2 fig 2 tab.

Descriptors: *Water reuse, *Tertiary treatment, *Water consumption, Research and development, Separation techniques, Ion exchange, Foam fractionation, Distillation, Flocculation, Flotation, Sedimentation, Lime, Phosphorus, Irrigation practices, Waste water treatment, California.

Waste water may one day cease to exist as a word simply because no water will be wasted. Since the only water fit to throw away will also be fit to drink, due to increasingly stringent regulations, it will be used for drinking. Future plans for desalinization of wastewater before discharge into Lake Mead, California, would result in the effluent being polluted by contact with Lake Mead waters. Reclamation has become a reality in Africa with the Windhoek plant. Effluent from a plant using: (1) floccu-

lation-flotation; (2) detergent removal by foam fractionation; (3) lime treatment; (4) chlorination; (5) settlement of calcium carbonate sludge; (6) sand filtration; (7) activated carbon adsorption; and (8) final rechlorination, is stored in a maturation reservoir from which drinking water is drawn. Although this and other installations are evidence that the technological know-how to reclaim effluents is available, the lack of adequate safeguards, monitoring devices, and public enthusiasm prevents widespread application. Reliability of these plants must be increased, new and faster monitoring devices must be developed, and people must be educated in water usage. (Lowry-Texas)
W72-00012

COAGULANTS FOR WASTE WATER TREATMENT,
Calgon Corp., Pittsburgh, Pa.
C. L. Fitsgerald, M. M. Clemens, and P. B. Reilly, Jr.
Chemical Engineering Progress, Vol 66, No 1, p 36-40, January 1970, 1 tab, 11 fig, 1 ref.

Descriptors: *Waste water treatment, *Effluent quality, Coagulation, Industrial wastes, Flocculation, Aluminum, Iron, Clays, Gels, Design, Oil, Pulp wastes, Cation adsorption, Anion adsorption.
Identifiers: *Coagulants, Polymers, Metal salts, Vegetable gums, Feed points.

The use of coagulants, whether of the conventional variety or the relatively new synthetic polymers, is a currently popular subject of conversation. Even though coagulants have been used for probably many centuries to stimulate flocculation, it is still impossible to determine conclusively why one flocculant may be effective at one time and suddenly become ineffective in the same or similar application. The methods of flocculation are discussed. The deficiencies of metal salts and natural polymers as coagulant aids are presented. Synthetic polymers are listed and their applications discussed. Case histories of the use of coagulants are presented as examples of various applications. It is interesting to note that similar problems are not always solved in the same way. In any potential application, the major factors to be considered are: (1) Solids size and electric charge; (2) Nature of oil waste, suspended or emulsified; (3) Polymer feed point (s); (4) Separation equipment design; and, (5) Polymer structure. After consideration of these factors, bench scale tests must be conducted to confirm, modify or refute the proposed treatment. And only then full scale plant application can provide the final proof. (Goessling-Texas)
W72-00014

THE CASE FOR DEEP AERATION TANKS,
Mixing Equipment Co., Inc., Rochester, N.Y.
J. Y. Oldshue.
Chemical Engineering Progress, Vol 66, No 11, November 1970, p 73-78, 3 tab, 9 fig, 7 ref.

Descriptors: *Waste water treatment, *Aeration, *Mass transfer, Impellers, Air.
Identifiers: *Submerged aerators, Biological solids, Oxygen uptake rate, Tank depth, Power, Driving force, Film coefficient, Interfacial area.

For years submerged turbine type aerators have been used in high and low aeration processes and in all tank sizes and shapes. The following is devoted to a discussion of the characteristics of various tank depths using submerged aerators with a separate gas supply. From the mass transfer equation only the term 'KLa' can be affected by the impeller design and the air variables. Comparisons between different depth tanks and different uptake rates indicate the effect of these variables. There is no way to calculate, from handbook values or physical properties, the mass transfer in a given slurry containing biological solids. Experimental data must be obtained on some scale and then mass transfer calculations used to convert to other conditions. A suitable method of calcculating the average driving force is needed. In this article the log mean of the 'delta' c at the bottom and at the top of the tank has been used. In general, there is no reason not to use an aeration system of any desired uptake rate and any desired liquid depth to achieve the desired plant performance. (Goessling-Texas)
W72-00015

CENTRIFUGES IN WATER AND WASTE TREATMENT,
Pennwalt Corp., Warminster, Pa.
F. W. Keith, and T. H. Little.
Chemical Engineering Progress, Vol 65, No 11, November 1969, 1 tab, 6 fig, p 77-80.

Descriptors: *Waste water treatment, *Industrial wastes, *Municipal wastes, *Centrifugation, Survey, Costs, Waste disposal, Settling velocity, Sedimentation, Waste treatment.
Identifiers: Suspended solids.

As stricter regulations are applied to industrial and municipal waste disposal, more efficient processes and equipment are needed to remove suspended solids, materials giving rise to BOD and other pollutants. Since primary sedimentation alone is rarely sufficient, secondary treatment is required and these processes produce a flocculant solid that settles slowly and compacts poorly under gravity. There are three basic types of centrifuges which have application in these circumstances. These are solid bowl conveyor centrifuge, disc centrifuge bowl and basket centrifuge. The operational characteristics and applications of these devices are pesented and discussed. The cost per unit capacity is shown. This survey of centrifuges treating industrial and municipal waste streams touches on only a few applications. The intention is to illustrate how centrifuges can be applied, the types of devices available and their characteristics. (Goessling-Texas)
W72-00016

PROCESS CONTROL OF CENTRIFUGE OPERATIONS,
DeLaval Separator Co., Poughkeepsie, N.Y.
D. M. Landis.
Chemical Engineering Progress, Vol 66, No 1, January 1970, 4 fig, p 51-53.

Descriptors: *Waste water treatment, *Industrial wastes, *Municipal wastes, *Dewatering, *Automatic control, *Centrifugation, Design, Laboratory tests, Pilot plants, On-site tests, Hydrogen ion concentration, Temperature, Viscosity, Turbidity, Particle size.
Identifiers: Configuration, Solids content.

Practical process control is a must if scale-up based on specific operating conditions is to result in satisfactory operation of the centrifuge. Centrifuges are generally supplied based on laboratory, pilot plant or field tests of the centrifuge performing the desired separations of the specific wastes to be treated. The choice of candidates for these tests is based upon: economics, type of separation desired, particle size of solids, solid content of feed, relative density of components, capacity desired and special considerations (pH, temperature and configuration). If the wastes change drastically from those tested without the operators knowledge, the centrifuge will not operate with the desired capacity or efficiency. Various control systems are available to monitor viscosity, solids content, particle size and turbidity. In addition, automatic alarm and shut-down devices are available which can be coupled with these monitors to effect process control. Process control is vital to all process operations and extremely so in utilizing centrifugal separators to their maximum work capability and work efficiency. (Goessling-Texas)
W72-00017

SLUDGE ACTIVITY PARAMETERS AND THEIR APPLICATION TO TOXICITY MEASUREMENTS AND ACTIVATED SLUDGE,
Florida Univ., Gainsville.
J. W. Patterson, H. D. Putnam, and P. L. Brezonik.
Proceedings, Industrial Waste Conference, 24th, May 6, 7, and 8, 1969, p 127-154, 16 fig, 2 tab, 48 ref.

Descriptors: *Waste water treatment, *Activated sludge, *Biochemical oxygen demand, *Chemical oxygen demand, Legislation, Effluents, Laboratory tests, *Toxicity.
Identifiers: Mixed liquor volatile suspended solids, Sludge volume index, Sludge age, Sludge yield, Dehydrogenase activity, Oxygen uptake rate, ATD analyses.

The inadequacies of activated sludge operation control parameters have long been recognized by waste treatment researchers and plant operators. Use of inappropriate monitoring methods for treatment unit degradation capabilities results in operation incompatible with both present legislative requirements for high quality effluent and economic requirements for high efficiency. The conventional methods of monitoring performance are discussed and the advantages and disadvantages of these measurements are presented. More specific biochemical parameters and their applicability to activated sludge systems under toxic stress are presented and discussed. The results of this study indicates: (1) the standard biomass and activity parameters (BOD, COD) are inadequate for current research and plant operation needs; (2) the application of biochemical concepts to measurement of activated sludge biomass and activity has advantages of sensitivity and specificity; (3) the application of any biochemical parameter requires an understanding of the basic cellular mechanism involved; (4) effect of toxic agents may vary according to the food supply and physiological state of the organisms. (Goessling-Texas)
W72-00020

DESIGN OF A TREATMENT PLANT FOR BAKERY WASTES,
Syracuse Univ., N.Y.
C. S. Grove, Jr., D. B. Emerson, E. F. Schlesinger, and W. Brown.
Proceedings, Industrial Waste Conference, 24th, May 6,7, and 8, 1969. p 155-178, 11 fig, 12 tab, 9 ref.

Descriptors: *Waste water treatment, *Pilot plants, *Emulsions, *Biochemical oxygen demand, Activated sludge, Ground water recharge, Water reuse, Sampling, Laboratory tests, Alkalinity, *Treatment facilities, *Standards, Effluents.
Identifiers: *Bakery wastes, Nitric acid, Washing compounds.

Treatment processes for bakery wastes have received relatively little attention in the past, primarily because bakery wastes are usually treated in the municipal wastewater treatment plant. In order to develop a wastewater treatment system for the Sweetgoods Bakery a complete design analysis was conducted. Preliminary investigations determined the strength and magnitude of wastewater flows. Laboratory studies indicated that the wastes could be treated biologically and that the cleaning solutions held the fats and greases in solution creating an abnormally high BOD. Pilot plant studies were run in the laboratory to determine the best configuration for the full scale plant. Various effluent disposal schemes were investigated for economic feasibility. The result of this design approach was an activated sludge plant with a capacity of 80,000 gpd and an efficiency of 99% at a loading of 40 lbs BOD/1000 cu ft of tank volume. Nitric acid was used to 'break' the emulsion and to provide sufficient nitrogen for proper growth of the biomass. The effluent met the Suffolk County Standards except for alkalinity measured as mg/l of calcium carbonate. The effluent can be used for lawn watering or grass plot irrigation without plugging of the soil or inhibiting organism growth. Further improvements can be made by optimizing the formulation of the washing compounds as this is the primary source of TDS and alkalinity. (Goessling-Texas)
W72-00021

REMOVAL OF WHITE WATER EFFLUENT TURBIDITY BY BIOLOGICAL TREATMENT PROCESSES,
John Hopkins Univ., Baltimore, Md.
W. L. Carpenter, and J. R. Janis.
Proceedings, Industrial Waste Conference, 24th, May 6, 7, and 8, 1969. p 209-226, 2 fig, 8 tab, 17 ref.

Descriptors: *Waste water treatment, *Turbidity, Pulp and paper industry, Kaolinite, Adsorption, Effluents, Laboratory tests, Biological treatment.
Identifiers: *White water, Starches, Titanium oxide, Exoenzymatic degradation, Mixed liquor suspended solids, Aeration times.

Kaolin, titanium oxide and starch are the major contributors to turbidity in papermill whitewater. A study has been conducted to determine why turbidity is removed in biologic treatment; to determine which parameters are significant in obtaining high removals; and to determine which starches contribute most to high effluent turbidities. Batch treatment trials were run using artificially induced whitewaters. Test water was synthesized using the underflow from the secondary clarifier of a kraft mill with controlled additions of the turbidity inducing substances. The results of these experiments indicated that: (1) the removal of starch induced turbidity by biological treatment depends primarily upon adsorption onto the sludge floc. Exoenzymatic degradation of the starch molecules by microorganisms maintains the adsorption capability of the floc. Starch turbidity decreases significantly during the initial contact and continues to decrease with aeration time. MLSS concentrations above 3000 mg/l yield highest initial removal and aeration times need not exceed 4 hours for high removal of starch-induced turbidity. Turbidity induced by oxidized starches was most difficult to remove, although high removals were obtained in studies simulating aerated stabilization basins with low MLSS. Cationic starches were quickly removed but turbidity built up with increased aeration time due to starch degradation and lessening of the coagulant properties. (Goessling-Texas)
W72-00022

WASTEWATER TREATMENT AT THE CHRYSLER CORP. TOLEDO MACHINING PLANT,
Chrysler Corp., Detroit, Mich.
A. R. Balden.
Proceedings, Industrial Waste Conference, 24th, May 6, 7, and 8, 1969. p 254, 7 fig, 2 tab.

Descriptors: *Waste water treatment, *Industrial wastes, *Oil, *Emulsions, Detergents, Sedimentation, Flocculation, Lime, Effluents, Eutrophication, Laboratory tests, Ohio, Treatment facilities.
Identifiers: Aluminum sulphate, Aluminum hydroxide, Air flotation, Chemical costs, *Toledo (Ohio).

The Toledo Machining Plant is located south of Toledo, Ohio, in Perrysburg Township which is drained by the Maumee River which empties into Lake Erie. The Maumee River has been identified as one of the main contributors to the eutrophication of Lake Erie. Chrysler Corporation determined that its Toledo Plant would not contribute to the deterioration of water quality and constructed an extensive wastewater treatment plant. The wastewaters are contaminated with oils, emulsion cleaners and alkaline detergents. The plant is oversized in some respects and allows batch treatment in a step by step manner with laboratory tests preceding each step to determine the degree of treatment required. Treatment consists of primary sedimentation, primary clarification, flocculation and air flotation and pH adjustment with lime for secondary clarification. The plant is operated from a control panel which incorporates a high degree of automation. This allows a minimum number of operators to provide close attention to those steps which require human judgment. Chemical costs for treatment are $0.23/1000 gal. Currently the plant need operate only three days a week. It is expected that as production grows, the wastewaters generated will become stronger and costs will rise. Laboratory work is still in progress to find ways to increase the amount of oils recovered from the wastewater. (Goessling-Texas)
W72-00023

PIGSKIN TANNERY WASTE,
Stanley Consultants, Inc., Muscatine, Iowa.
L. L. Pruitt.
Proceedings, Purdue Industrial Waste Conference, 24th, May 6, 7, and 8, 1969. p 263-272, 4 fig.

Descriptors: *Waste water treatment, *Design, Survey, Sampling, Laboratory tests, Alkalinity, Hydrogen ion concentration, Coagulation, Chromium, Precipitation, *Treatment facilities.
Identifiers: Tannery wastes, Dissimilar wastes, Clarifier-thickener.

Development of waste treatment facilities for a tannery is a challenging task since little dependable information was found on the subject. The tanning process involves six different steps each producing a different wastewater. In addition coloring, pasting and wash down waters each contributed independent formulations of contaminated water. The treatment plant was designed for a new tannery and advantage could be taken of an existing tannery which used similar processes. A week long, 24 hour a day survey of the wastewaters in the existing plant provided data on flows to be expected and the make-up of each waste. Bench scale tests conducted in the laboratory permitted a determination of the best methods of collection and treatment. Waste waters are directed to a holding tank or an equalization tank as needed. After equalization, the combined wastes are treated with coagulant aids and discharged into a clarifier-thickener. Advantage can be taken of the excess alkalinity of one of the waste to maintain the pH above 9.3 for precipitation of trivalent chromium, a constituent of the tanning wastewater. The effluent of the clarifier is pumped to the municipal treatment plant and the sludge is mixed with municipal treatment plant sludge in the ratio of 3:1 for dewatering. (Goessling-Texas)
W72-00024

A NEW PROCESS FOR RECOVERY OF BY--PRODUCTS FROM SHELLFISH WASTE,
Food, Chemical, and Research Labs., Inc., Seattle, Wash.
Q. P. Peniston, E. L. Johnson, C. N. Turrill, and M. L. Hayes.
Proceedings, Industrial Waste Conference, 24th, May 6, 7, and 8, 1969. p 402-412, 7 fig, 3 tab.

Descriptors: *Pollution abatement, *Byproducts, Shellfish, Industrial wastes, Proteins, Calcium carbonate, Economics, Odor, Taste, Capital costs, Operating costs, Nitrogen, Lipids, Waste water treatment.
Identifiers: Chitin, Animal feed, Fish protein concentrate, Ash, *Shellfish wastes.

The shell fish industry produces waste products, equal to 65 to 75% of the weight of the shellfish processed. Usually, these wastes are dumped back into the sea. Where several plants are located on the same bay or river, gross pollution of the water results. The waste material consists of calcium carbonate, chitin and protein. The production of chitin and derivatives from shellfish waste has been suggested many times and attempted commercially at least once. There has been no attempt to develop an integrated process to recover essentially all values from these wastes. A process is described for chemical treatment of shellfish wastes to yield protein, chitin and calcium chloride brine as products. Pollution abatement by employment of the process should be as nearly complete as is practical for any recovery process. The process can be developed in several modifications to suit local conditions and market possibilities. Estimated costs for a 15 million pound per year plant were $840,000 with an investment of $1,250,000. Estimated sales totaled $1,330,000. (Goessling-Texas)
W72-00025

OPERATION OF A TREATMENT WORKS HANDLING THE WASTES FROM THE PROCESSING OF TRUCK BODIES,
International Harvester Co., Louisville, Ky. Farm Equipment Div.
H. S. Garceau.
Proceedings, Industrial Waste Conference, 24th, May 6, 7, and 8, 1969. p 957-961.

Descriptors: *Waste water treatment, *Industrial wastes, Alkaline water, Acidic water, Oily water, Chemical precipitation, Sedimentation, Sludge disposal, Treatment facilities.
Identifiers: Caustic.

This plant is a large, complex manufacturing installation which includes all of the operations to produce finished trucks. A variety of waste waters are produced: alkaline cleaning water, chromic acid water, iron or zinc phosphate in water, caustic water, paint booth water, machine coolants, waste oils, washing machine liquids, oil emulsions and kerosine emulsions. Initially some 360 different liquids were used in the plant. A detailed study has reduced this number to 100. The total production of waste water is 30.000 gallons every 50 hours. Provisions are made throughout the plant to treat waste water before it becomes mixed with other contaminants. This treated water is then recycled in the same process, the residue being piped to the central treatment plant. Neutralization, pH adjustment and chemical processes are used in these small operations. The industrial waste waters are all carried to the central treatment plant by an in-plant sewer completely isolated from the sanitary sewer system. A 10,000 gallon receiving tank and two 15,000 gallon pretreatment tanks are used. This allows for a 20 hour settling period in the 15,000 gallon tanks with flotation and settling the primary processes. Waste oil, cast iron chips and steel chips are sold. The sludge is mixed with casting sand and landfilled. The unpolluted but unpotable effluent is discharged to the storm sewer. Total cost of this system is $750,000. (Goessling-Texas)
W72-00026

EXPERIENCE IN THE TREATMENT AND RE--USE OF INDUSTRIAL WASTE WATERS,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering.
C. E. Renn.
Proceedings, Industrial Waste Conference, 24th, May 6, 7, and 8, 1969. p 962-968.

Descriptors: *Water reuse, *Waste water treatment, *Industrial wastes, Oxidation ponds, Algae, Benthic fauna, Watersheds, Water shortage filters, Snails, Odor, Cooling towers, Filters, Effluent sampling.
Identifiers: Hydrogen sulfide, Imhoff tanks, Precipitates.

The worlds largest electric machine tool plant reuses it's water on a regular basis. Initially, the plant had an adequate water supply from 3 to 5 wells pumping at a rate of 100 to 150 gpm. Plant expansion and new processes forced the development of a water reuse scheme. Waste water from the plant is treated in 2 Imhoff tanks and a high rate trickling filter and then stored in a large pond. Water is drawn from the pond, filtered and fed back to those parts of the plant that can use it or be adapted to use it. There were numerous problems associated with perfection this system, the pond goes anaerobic in the summer, hydrogen sulfide produced in the pond escaped into the plant, snails collected in dead ends, algal filaments clogged heat exchangers, cooling water tunnels were stopped up and odors were emitted from the evaporative coolers. Approaches to the solution of these problems, successful and unsuccessful, are presented and the results discussed. A unique profile sampler was developed and used to determine the water quality. The changes that occur in the pond are discussed and an indication of the processes bringing about these changes are presented. Predictably, the pond is gradually filling with precipitates. In the process, the company has made a lot of use of a little water and is discharging

a better effluent to the receiving stream. (Goessling-Texas)
W72-00027

PROJECTED WASTEWATER TREATMENT COSTS IN THE ORGANIC CHEMICALS INDUSTRY,
Gurnham, Bramer and Associates, Inc., Chicago, Ill.
H. C. Bramer, and C. F. Gurnham.
Proceedings, Industrial Waste Conference, 24th, May 6, 7, and 8, 1969. p 979-988, 5 fig, 6 tab.

Descriptors: *Waste water treatment, *Cost analysis, Chemical wastes, Effluents, Industrial wastes, Data collection, Forecasting, Unit costs, Operating costs, Capital costs.
Identifiers: *Estimation methodology, Effluent quality, 5 year projection, Chemical industry.

An estimate has been developed of the costs to the organic chemical industry of attaining over the next five years State Water quality standards and of specific levels of removal of significant pollutants. A generalized methodology has been developed by which similar continuing estimates can be made for other water using industries. Data was gathered from 53 organic chemical plants to estimate present treatment methods and costs and to allow prediction of future methods and costs. The information indicated that there has been a uniform distribution of dollars and effort expended in this field over the industry. The results of this application of resources has been equally varied. Some plants have adequate treatment to meet present and future standards of effluent quality and others have inadequate facilities to meet current standards. This data has been analyzed and costs to treat waste waters from organic chemical plants to each of six levels of treatment for the next five years are estimated. Capital costs vary from $159 million in 1969 for the removal of gross pollutants to $1,804 million in 1973 for 100% removal of BOD, COD and suspended solids. Operational costs are shown for the same period and levels of treatment. They vary from $16 million to $388 million. The generalized methodology developed can be used for any water using industry. (Goessling-Texas)
W72-00028

PRECIPITATE FLOTATION OF COMPLEXED CYANIDE,
Kentucky Univ., Lexington. Dept. of Chemical Engineering.
R. B. Grieves, and D. Bhattacharyya.
Proceedings, Industrial Waste Conference, 24th, May 6, 7, and 18, 1969. p 989-997, 3 fig, 25 ref.

Descriptors: *Waste water treatment, *Inorganic compounds, *Flotation, Surfactants, Iron, Distillation, Chemical precipitation.
Identifiers: Gas bubble attachment, *Cyanide.

Inorganic precipitates can be floated to the surface on a suspension and physically removed in a foam rising above the suspension. A surface-active agent of the opposite charge to the precipitate is adsorbed on the surfaces making the particulates hydrophobic and susceptible to gas bubble attachment. The initial charge of the precipitate can be determined by exchange of ions from solutions with the ions of the precipitates. This determines the surfactant to be used. Experiments have been conducted on foam separation of cyanide complexed by ferrous iron. Effects of Fe/CN ratio, pH, mixing times, ionic strength were determined. At Fe/CN ratios of 0.550 and a pH of 6.0, 95% of the complexed cyanide can be removed from distilled water with initial concentrations of 1.5-3.1 mM in total cyanide and using about 0.04/moles of cationic surfactant/mole of complexed cyanide. The residual non-complexed cyanide, about 0.27 mM, can be removed by other means. The collapsed foam is about 11% of the initial suspension volume. Ninety percent of the surfactant is carried into the foam. As ionic strength increases, flotation decreases, but this can be counteracted by increasing the molar surfactant/complexed cyanide ratio. (Goessling-Texas)
W72-00029

ZIMPRO WET OXIDATION OF SODA PULPING LIQUORS,
Zimpro Inc., Rothschild, Wis.
G. H. Teletzke, and L. A. Pradt.
Proceedings, Industrial Waste Conference, 24th, May 6, 7, and 8, 1969, p 1195-1200. 5 fig, 4 ref.

Descriptors: *Waste water treatment, Pulp wastes, Chemical oxygen demand, Laboratory tests, Pilot plant, Air pollution, Automatic control, Explosions.
Identifiers: *Soda pulping process, Black liquor, Chemical recovery, Waste heat recovery, Thermal efficiency.

Associated Pulp and Paper Mills, Ltd. is an Australian pulp and paper company with its principle manufacturing facilities in Burnie, Tasmania. The company uses the straight soda process for pulping the native eucalyptus. The original soda recovery system was old, and inefficient. After several years of study, the Zimpro Wet Oxidation Process was selected for soda recovery. Laboratory studies and pilot plant studies resulted in a small unit to process black liquor corresponding to 30 pulp tons per day. This unit was constructed and placed on line in 1966. Results to date indicate a high chemical recovery, no air pollution problems, thermal efficiency up to 85% and no explosion hazards. The plant provides a pleasing appearance and pleasant working conditions. The operation can be completely automated but the savings would be relatively small. A larger unit is now in the design stage and it is hoped that this plant will be on line in 1971. Capital costs are higher than for conventional smelter-furnaces but the better operating efficiencies offset this. It is expected that the Wet Oxidation Process will allow some improvements in the soda pulping process to be developed. (Goessling-Texas)
W72-00032

MANPOWER REQUIREMENTS AND NEEDS FOR WASTE WATER TREATMENT FACILITY OPERATION,
Environmental Science Services, Corp., Stamford, Conn.
R. N. Rickles, and W. W. Eckenfelder.
Proceedings, Industrial Waste Conference, 24th May 6, 7, and 8, 1969, p 1286-1299. 15 tab.

Descriptors: *Waste water treatment, *Manpower, *Education, Industrial wastes, Water quality, Pulp and paper industry, *Treatment facilities.
Identifiers: Task functions, Chemical industry, Petroleum industry.

As a part of an overall program to develop operator training materials, a survey of industrial waste water treatment facilities was made to determine the operator requirements for education and skills. This evaluation centered on the needs rather than the actual status of these facilities and presumed compliance with existing state and federal requirements. This summary includes the findings relative to nine major water using industries: Automobile, Fiber and Textiles, Ferrous Metallurgical, Food Processing, Meat and Poultry Packing, Metal Finishing, Petroleum Refining, Chemical, and Pulp and Paper. The study is based on data acquired by site visits, other contacts and the experience of the project team. Among the factors studied were the following: (1) treatment categories; (2) treatment sequences; (3) definition of various task functions, (4) educational needs of task functions; (5) relationships of task functions to personnel requirements; (6) estimation of full time equivalents and number of people requirements; and, (7) actual practices. (Goessling-Texas)
W72-00033

THE USE OF ULTRAFILTRATION MEMBRANES FOR ACTIVATED SLUDGE SEPARATION,
Dorr Oliver, Inc., Stamford, Conn.
C. V. Smith, D. DiGregorio, and R. M. Talcott.
Proceedings, Industrial Waste Conference, 24th, May 6, 7, and 8, 1969, p 1300-1310. 9 fig, 2 tab.

Descriptors: *Waste water treatment, *Activated sludge, Size, *Filtration, *Membranes, Separation techniques.
Identifiers: *Ultrifiltration, Organic polymer, Suspended solids.

A sewage treatment facility was developed for a small manufacturing company employing 120 people and creating 3600 gallons of sewage per day. A room 10 feet by 15 feet was allocated for this unit. Dorr Oliver took this opportunity to construct a prototype ultrafiltration unit for liquid-solids separation. Basically the facility is an activated sludge process operated at a high MLVSS (10,000 to 15,000 mg/l) with the ultrafiltration device as a secondary clarifier. The filtration membranes are non-cellulosic organic polymers. The filter is constructed so that a thin skin, approximately 5 microns thick, is placed over a porous substructure of the same material. The total thickness of the filter membrane is 6 to 8 miles. The filter operates at pressures ranging from 20 to 50 psi, so the membrane is reinforced with a non woven material, paper in this instance. The filter membranes are assembled in modules of sixty square feet of filtration surface. These modules can then be assembled into any size unit desired. Reactor tank effluent is passed through the filter at 5 fps and periodically the direction of flow is reversed to prevent solids build-up on the membrane. The ultrafiltration system has been operated for six months with 95% BOD removal, 100% suspended solids removal and a low coliform count in the discharge. (Goessling-Texas)
W72-00034

THE EFFECT OF SURFACE ACTIVE AGENTS ON SUBSTRATE UTILIZATION IN AN EXPERIMENTAL ACTIVATED SLUDGE SYSTEM,
National Sanitation Foundation, Ann Arbor, Mich.
N. I. McClelland, and K. H. Mancy.
Proceedings, Industrial Waste Conference, 24th, May, 6, 7, and 8, 1969, p 1361-1384. 5 tab, 16 ref.

Descriptors: *Activated sludge, *Inhibition, *Alkylbenzene sulphonates, *.inear alkylate sulphonates, Toxicity, Mass transfer, Waste water treatment, *Detergents.
Identifiers: Extracellular hydrolysis.

The purpose of this investigation was to determine: (1) to what extent 'soft' detergents affect the performance characteristics of an experimental activated sludge system; (2) how this affect compares with that of a 'hard' detergent; and (3) to provide a conceptual understanding of the mechanism of interference of compounds with surface active characteristics on this type of treatment process. Six laboratory scale activated sludge units were operated in parallel. Seed organisms were obtained from a local treatment plant and a milk based synthetic sewage was used as a substrate. Two units were retained as controls and the remaining four units had surface active agents, of the type mentioned above, added in concentrations varying from 5 to 20 mg/l. Both types of detergents affected the rate of substrate removal. The extent of this effect was related to the structure and concentration of the surface active agent present in the system. The concentration of detergents used eliminates toxicity as the means of reducing treatment efficiency. Either or both of the two remaining mechanisms of inhibiting substrate utilization, extracellular hydrolysis or reduction in rates of mass transport, could be the cause of reduced treatment efficiency. Regardless, 'hard' detergents in concentrations of 5 or more mg/l or 'soft' detergents in concentrations of 10 or more mg/l interferred significantly with substrate utilization. (Goessling-Texas)
W72-00035

CHEMICAL CONDITIONING OF BIOLOGICAL SLUDGES FOR VACUUM FILTRATION,
Notre Dame, Univ., Ind.
M. W. Tenney, W. F. Echelberger, J. J. Coffey, and T. J. McAlbon.
Proceedings, Industrial Waste Conference, 24th, May 6, 7, and 8, 1969, p 1426-1447. 1 tab, 12 fig, 28 ref.

Descriptors: *Sludge treatment, *Dewatering, Flocculation, Iron, Aluminum, Activated sludge, Vacuum drying, Filtration, Waste water treatment, Flocculation.
Identifiers: *Chemical conditioning, *Vacuum, filtration, Polyelectrolytes.

Properly operated activated sludge plants develop well flocculated sludge through the biological production of polymeric flocculants, these naturally produced materials are not at all effective as conditioners of waste sludge for vacuum filtration. Chemical conditioners such as the polyvalent metal ions of Al (III) and Fe (III) or synthetic organic polyelectrolytes (anionic cationic or non-ionic) are negative in order to porperly structure the waste sludge for successful dewatering. The action of these additives is interpreted as being similar to the microbially produced polymers which serve to biologically flocculate activated sludge. Chemical conditioners, to be effective, must be capable of forming polymeric species which bridge the spaces between discrete particles, developing a relatively rigid structure that is porous in the presence of a vacuum. From this laboratory study, it is concluded that the carriage water quality parameters of pH, alkalinity and phosphate concentration and the sludge parameters of solids concentration, storage time and primary/waste sludge mix ratio all effect the conditioner dosage required to enhance the dewatering of waste activated sludge. It is also apparent that treatment studies are required for each waste water treatment plant to determine the optimal chemical conditioning process necessary for effective dewatering by vacuum filtration. (Goessling-Texas)
W72-00037

THE GRAVER C.I. PROCESS CONTINUOUS COUNTERCURRENT FILTRATION AND ADSORPTION,
Graver Water Conditioning Co., Union, N.J.
J. A. Levendusky.
Proceedings, Industrial Waste Conference, 24th, May 6, 7, and 8, 1969, p 1477-1485. 3 fig.

Descriptors: *Waste water treatment, *Filtration, *Adsorption, Optimization, Media, Economics.
Identifiers: *Ion exchange, Continuous operation, Unit operation, Regeneration.

The basic concept and theory of filtration and adsorption have been widely published in the literature. Specific applications of these processes have been studied extensively in pilot plant and laboratory scale experiments. Unfortunately, the data derived from these operations do not clearly show how efficiently unit operations can be utilized. A review of Graver's projects makes it apparent that the Graver C.I. process is a practical, proven tool for carrying out continuous filtration and adsorption. The process consists of three unit operations carried out in series: ion-exchange, filtration and adsorption. Each column is designed to allow near continuous operation. The media can be bled from the towers on a continuous or periodic basis coupled with short periods (20-30 seconds) during which the remaining exhausted media is drained from the tanks. At the same time, fresh media is fed into the columns to permit continued operations. The exhausted media can then be regenerated by the most economical means and returned to service. Properly mechanized, the operation can be automated and little operator attention is required. Economy is achieved by using separate columns for each of the unit operations allowing optimization of each for its function. The Graver CI process offers the possibility of practical and economical solution to many problems in the industrial waste field. (Goessling-Texas)
W72-00040

COMBINED WASTEWATER COLLECTION AND TREATMENT FACILITY, MOUNT CLEMENS, MICHIGAN,
Spalding, DeDecker and ssociates, Inc, Madison Heights, Mich.
Vijaysinh U. Mahida.
Preprint, 44th Annual Conference, Water Pollution Control Federation, Session 4, No 4, October 3-8, 1971, San Francisco, Cal 11 p.

Descriptors: *Storm run-off, *Suspended solids, *Recreation, *Treatment facilities, Sampling, Monitoring, Automatic controls, Aeration, Sedimentation, Filtration, Anaerobic digestion, Chlorination, Disinfection, Ultraviolet light, Algae, Oxygenation, Biochemical oxygen demand, Water sports, Parks, Cost analysis, Michigan, Waste water treatment.
Identifiers: *Combined sewers, *Suspended solids, Backwashing, *Mount Clemens (Mich).

The city of Mount Clemens, Michigan, has 50 miles of combined sewers serving 3.06 square miles, and 10 miles of sanitary sewers plus 6 miles of storm sewers serving an additional 0.8 square miles. Interceptors were designed to collect stormwater overflows from two locations on the combined sewers, serving 212 acres and pump it to a small lake. This first lake provided settling, natural and mechanical surface aeration, and both aerobic and anaerobic digestion. Storm overflows could then be drawn off at a controlled 1.0 mgd rate to a microstrainer. Ultraviolet radiation equipment for algae control was also installed with the microstrainer, so the two combined provided mechanical filtration, suspended solids and incidental BOD removal, and algae removal. Before entering the second lakelet, the effluent also is subjected to chlorine-chlorine dioxide disinfection. Lakelet 2 was designed to provide chlorine contact time, natural surface aeration, and photosynthetic oxygenation, while lakelet 3 provided mechanical as well as surface aeration. A pressure sand filter was then designed as a polishing step. The entire treatment system was included as part of an inner-city park. Cost of this system was $7000 per acre benefited, whereas cost of sewer separation only was estimated at $15,000 per acre. (Lowry-Texas)
W72-00042

DIRECT DIGTAL CONTROL AT GRAND RAPIDS, MICHIGAN,
McNamee, Porter and Seeley, Ann Arbor, Mich.
James Curtis, and Marvin Van Eyck.
Preprint, 44th Annual Conference, Water Pollution Control Federation Session 2, No. 3, October 3-8, 1971, San Francisco, California. 8 p.

Descriptors: *Automatic control, *Digital computers, Waste water treatment, *Treatment facilities, Sampling, Monitoring, Flow control, Electronic equipment, Gates, Valves, Analytical techniques, Water analysis, Phosphate, Dissolved oxygen, Storm run-off, Operation and maintenance, Incineration, *Cost analysis, Personnel, Michigan.
Identifiers: *Grand Rapids (Mich).

At current bond prices, it is financially attractive to spend up to $100,000 in capital cost in order to save the cost of one man-shift per day. If the proposed 50-25-25 (Federal-State-Local) financing of capital cost is achieved, the ratio of capital cost per man-shift changes to $400,000:1. To achieve this reduction in the number of man-shifts a direct digital control system was designed for the city of Grand Rapids, Michigan's wastewater treatment facilities. The system would provide both monitoring and control of the plant. A dual channel Technicon Auto Analyzer, a Perkin Elmer atomic absorption spectrophotometer, and a Precision Scientific COD analyzer were selected for monitoring of the waste stream, and they will input directly to the main computer for storage of the data. Control over the plant functions is accomplished through flow control and reduction of overflows from storms. Cost of the system was approximately $800,000, and the plant will tentatively be in full operation by early 1972. (Lowry-Texas)
W72-00043

OPERATIONAL AND MAINTENANCE EXPERIENCE IN SCREENING DIGESTED SLUDGE,
Hyperion Treatment Plant, Los Angeles, Calif.
William F. Garber.
Preprint, 44th Annual Conference, Water Pollution Control Federation, Session 8, No. 5, October 3-8, 1971, San Francisco, California. 28 p, 9 fig, 10 ref.

Descriptors: *Sludge disposal, *Oceans, *Screens, Sieves, Corrosion, Odor, Organic loading, Landfill, *Operation and Maintenance, Cost analysis, Hydrogen Sulfide, Water quality control, *Waste water treatment, California.
Identifiers: *Noise, *Santa Monica Bay.

Digested sludge solids from Los Angeles's Hyperion Treatment Plant, after screening through 6 mesh, have been discharged to the head of a submarine canyon in Santa Monica Bay, California since September 1957. Slanted surface circle throw vibrational action and horizontal surface reciprocating horizontal differential motion screens have been successfully used to remove floatable materials for disposal to a landfill. The most difficult of the operation and maintenance problems have been corrosion, odor, and noise. Operation and maintenance costs have been $3500 per unit per year for the slanted surface screens, and $4,000 per unit per year for the horizontal surface screens. Environmental effects both aesthetic and physical, have been minimal due to strict rules regarding both color and floatables. Consultants have recommended expansion along the present lines, since sludge disposal in any other manner would also create pollution of either the air or groundwater. Therefore, ocean disposal seems to provide the least net pollutional effect. (Lowry-Texas)
W72-00044

STUDIES OF MUNICIPAL WASTEWATER RENOVATION FOR INDUSTRIAL WATER,
Bechtel Corp., San Francisco, Calif. Environmental Systems Group.
Clark L. Weddle, David G. Niles, E. Goldman, and J. W. Porter.
Preprint, 44th Annual Conference, Water Pollution Control Federation, Session 5, No. 1, October 3-8, 1971, San Francisco, California. 44 p, 13 fig, 8 tab, 14 ref.

Descriptors: *Municipal wastes, *Water reuse, *Separation techniques, Activated sludge, Nitrification, Chemical precipitation, Lime, Activated carbon, Adsorption, Phosphorous, Cooling towers, Pilot plants, *Waste water treatment, California, Heavy metals, Biological treatment, *Industrial use (Water).

Comparative investigations of biological treatment methods, including activated sludge, nitrification and denitrification, and physical-chemical treatment methods such as coagulation, flocculation, sedimentation, filtration, and activated carbon adsorption are being conducted by the Contra County California Water and Sewage Districts and the Environmental Protection Agency. Pilot facilities treat from 10,000 to 35,000 gal/day, and the effluent is then continuously used as make-up for pilot sized cooling towers or as boiler feed water. Renovated municipal wastewater has been satisfactorily produced for these two uses. Heavy metals and trace organics (pesticides, phenols, detergents) are significantly reduced by biological, chemical and physical - treatment renovation processes. Phosphorus removals in excess of 95% have been achieved in lime precipitation studies, and nitrogen can also be removed if mixed liquor solids separation can be controlled during nitrification and denitrification. Chemical precipitation and carbon adsorption treatment of municipal sewage can result in an effluent comparable to that produced by activated sludge followed by carbon adsorption if odors can be controlled. (Lowry-Texas)
W72-00045

PRELIMINARY DESIGN AND DEVELOPMENT OF THE INTERMEDIATE WATER RECOVERY SYSTEM, (VOLUME I).
Garrett Airesearch Manufacturing Co., Los Angeles, Calif.

Available from the National Technical Information Service as N71 22513, $3.00 in paper copy, $0.95 in microfiche. Garrett Airesearch Report No. 70-7018, Rev. 1, March 12, 1971. 228 p, 78 fig, 23 tab.

Descriptors: *Waste water treatment, *Water treatment, *Vapor compression distillation, Humidity, Urine, Pressure, Temperature, Disinfection, Bacteria, Water balance, Stroage, *Water reuse, Automatic control, Maintenance, Brines, Separation techniques.
Identifiers: *Space missions, *Pyrolysis.

Waste water treatment and recovery posed a pressing problem for astronauts involved in extended space missions. Functions of a recovery unit included the collection, processing, and storage of urine, washwater, and humidity condensate. Such a unit was designed for a one year mission duration and 90 day resupply. Final components of a dual system (each half producing one lb/hour of potable water) were: (1) a two stage vortex vapor compressor; (2) heater-condenser; (3) phase separator; (4) pyrolysis reactor; (5) level and concentration controller. The basic water reclamation process chosen was vacuum distillation followed by vapor pyrolysis as a secondary clean-up. Two loops, one for brine or washwater, and one for vapor provide the initial separation of the potentially potable water from the waste materials. Tests revealed reliability and maintenance to be serious problems, both from the point of difficulty in locating malfunctions, and from the health standpoint. Further testing is recommended. (Lowry-Texas)
W72-00046

MULTI-TIME PERIOD, FACILITIES LOCATION PROBLEMS: A HEURISTIC ALGORITHM WITH APPLICATIONS TO WASTEWATER TREATMENT SYSTEMS,
Massuchusetts Univ., Amherst. Water Resources Research Center.
Harjit S. Bhalla.
Doctoral Dissertation, Operations Research, August 1970. 87 p, 6 fig, 5 tab, 23 ref.

Descriptors: *Mathematical models, *Linear programming, *Cost analysis, Transportation, Construction, Waste water treatment, *Treatment facilities, Sites.
Identifiers: *Algorithms.

The advent of the regionalized wastewater treatment system has stimulated interest in cost analyses concerning facilities location, facility operation, and transportation costs. A heuristic approach was taken to avoid exhorbitant computer time charges. The problem was divided into two parts, with part 1 not allowing facility expansion and part 2 allowing it. A three phase heuristic algorithm was then developed for part 1. A most central facility is defined and each system facility checked relative to it to see if some of the unallocated demand centers can be profitably assigned to it. The facility giving the most advantage is added to the solution, a most central facility, relative to the remaining unallocated sources is defined again, the procedure is repeated until no facility can be profitably added. The remaining unallocated sources are assigned to the current most central facility. In the second phase, demand centers are divided into fixed and free, and attempts are made to assign free demand centers to facility locations not in the solution. When no further such assignments can be made, the phase is terminated. In the third phase, timing of the facility construction is manipulated so as to realize a less expensive solution. Computational results for 5 test problems are presented. (Lowry-Texas)
W72-00048

A STUDY OF COLOR REMOVAL FROM TEXTILE DYE WASTES BY CHEMICAL COAGULATION,
Auburn Univ., Ala. Dept. of Civil Engineering.
George R. Davidson, Jr.
Master's Thesis, August 1968, 39 p, 12 fig, 3 tab, 6 ref. OWRR A-011-ALA (2).

Descriptors: *Coagulation, *Zeta potential, *Color, Colloids, Bound water, Stability, Hydrogen ion concentration, Separation techniques, Cost analysis, Textiles, Industrial wastes, *Waste water treatment.
Identifiers: *Dye wastes, *Isoelectric point, *Alum, Coagulant aids.

Chemical coagulation studies of color removal from textile dye wastes were conducted using alum, with and without pH adjustment, and in combination with polymeric coagulant aids. Although coagulant aids in some concentrations broadened the effective pH range to give equally good results in color removal at different pH values, alum alone with pH adjustment generally produced better results. Color removal in excess of 90% was obtained at pH 5.0 with 50 mg/l alum at a cost of $84.33 per million gallons. 450 mg/1 of alum alone with no pH adjustment resulted in 82% color removal. The associated cost was $121.50 per million gallons treated. However, this method of treatment was not recommended since the pH of the effluent would be too high for discharge without further pH adjustment. (See also W72-00050) (Lowry-Texas)
W72-00049

COAGULATION OF TEXTILE DYE WASTES,
Auburn Univ., Ala. Dept. of Civil Engineering.
Albert R. Seibenhener.
Master's Thesis, December 1969, 57 p, 23 fig, 8 tab, 14 ref. OWRR A-011-ALA (3).

Descriptors: *Coagulation, *Electrokinetic potential, Color, Colloids, Zeta potential, Bound water, Stability, Hydrogen ion concentration, Separation techniques, Cost analysis, Textiles, Industrial wastes, *Waste water treatment.
Identifiers: *Dye wastes, *Isoelectric point, *Sols, Alum, Ferric sulfate, Hydrophobic, Hydrophilic.

Coagulation studies were performed on textile dye wastes in an attempt to determine a minimum cost process for color removal. Vat dye wastes and a mixture of vat and sulfur dye waste were coagulated with ferric sulfate and alum. Alum produced good color removals (80%..) from vat dye wastes at all pH values ranging from 6.0 to 12.2 A maximum color removal of 86% at pH 12.2 required 3865 mg/l, while 86% removal at pH 6.0 required only 220, mg/l. The maximum overall color removal achieved of 80% occurred at pH 10.0 at analum dosage of 1240 mg/l. The associated cost was $582.50 per million gallons. The most economical removal of 84% occurred at pH 6.0 and 200 mg/l of alum. The associated cost was $398 per million gallons, with $349 of that figure used for pH adjustment. A 50% vat and 50% sulfur dye waste mixture, having a pH of 11.2 was prepared and subjected to both alum and ferric sulfate coagulation. The optimum cost for 80% color removal was $113.40 per million gallons with 240 mg/l alum at pH 10.0, and $109.07 per million gallons with 600 mg/l ferric sulfate at pH 11.2. If high pH wastes could not be discharged treatment at pH 7.0 with 196 mg/l alum would provide 80% color removal at $126 per million gallons. The use of Separan AP30 as a coagulant aid was not justified from any of the results obtained. A 5 to 10% BOD removal can also be obtained by removal of the color causing substances from the waste. (See also W72-00049) (Lowry-Texas)
W72-00050

DISPATCHING SYSTEM FOR CONTROL OF COMBINED SEWER LOSSES,
Minneapolis-Saint Paul Sanitary District, Minn.
For primary bibliographic entry see Field 05G.
W72-00080

COMBINED SEWER OVERFLOW ABATEMENT ALTERNATIVES: WASHINGTON, D.C.,
Weston (Roy F.), Inc., West Chester, Pa.
Phillip L. Buckingham, Chia S. Shih, James G. Ryan, James A. Lee, and John K. Kane.
Copy available from GPO Sup Doc as SN-5501-0102, $2.00; microfiche from NTIS as PB-203 680, $0.95. Environmental Protection Agency, Water Quality Office, Water Pollution Control Research Series No 11024EXF, August 1970, 244 p, 33 fig, 23 tab, 50 ref. EPA, WQO Contract No. 14-12-403.

Descriptors: *Storm runoff, *Overflow, *Flow measurement, *Underground storage, *Filtration, Design storm, Depth-area-duration analysis, Rainfall-runoff relationships, Organic loading, Treatment facilities, Tunnel design, Reservoir design, Sewers, Capital costs, Annual costs, Comparative costs, Geology, Tracers, Analysis, Sludge, Hydrology, District of Columbia.
Identifiers: *Combined sewers, *Storm water, Potomac River.

Objective of the project were: (1) define the characteristics of combined sewer overflow; (2) investigate the feasibility of high-rate filtration for treatment of combined sewer overflow; and (3) develop and evaluate alternate methods of solution. Investigative activities included: review of pertinent reports and technical literature; field monitoring of combined sewer overflows and separated storm water discharges at three sites; laboratory studies of ultra-high-rate filtration of combined sewer overflow; hydrological analysis; and evaluation of feasible alternatives (based on conceptual designs, preliminary cost estimates, and other factors). Reservoir Storage, Treatment at Overflow Points, Conveyance Tunnels and Mined Storage, and Sewer Separation were the approaches considered sufficiently promising for detailed evaluation. Tunnels and Mined Storage with treatment at the Blue Plains plant and at Kingman Lake after subsidence of the storm is recommended. Estimated capital costs (based on the 15-year storm) are $318,000,000 with annual operation and maintenance costs of $3,500,000. This approach also was preferable to the others on the basis of systematic evaluation of reliability, flexibility, public convenience and other non-quantifiable factors.
W72-00082

CLARIFICATION OF TURBID WATER BY FILTER FABRICS,
Corps of Engineers, Omaha, Nebr.
For primary bibliographic entry see Field 05G.
W72-00120

REGULATIONS CONCERNING TREATMENT OF WASTEWATERS, DOMESTIC AND INDUSTRIAL, SEPARATELY OR IN COMBINATION, DISCHARGED INTO THE WATERS OF THE HACKENSACK RIVER.

New Jersey State Department of Environmental Protection, Division of Environmental Quality, Bureau of Water Pollution Control, Trenton, New Jersey, March 1967. 2 p.

Descriptors: *New Jersey, *River basins, *Biochemical oxygen demand, *Standards, Water pollution, Water quality, Water quality control, Water pollution control, Pollution abatement, Waste water (Pollution), Waste water disposal, Waste water treatment, Industrial wastes, Domestic wastes, Regulation, Administrative agencies, Legal aspects, Legislation.

Pursuant to their statutory authority the State Department of Environmental Protection promulgates the following regulations concerning treatment of wastewaters, domestic and industrial, separately or in combination, discharged into the Hackensack River Basin. Depending on the classification of the specific waters involved, the regulations require sufficient treatment to provide either eighty or ninety percent reduction of biochemical oxygen

demand at all times, including any four-hour period of a day when the strength of the wastes to be treated might be expected to exceed average conditions. The objective of the regulations is, depending on the classification involved, to limit biochemical oxygen demand of effluents to either 25 or 50 parts per million. It is recognized, especially in connection with some industrial wastes, that the pollution load imposed upon the waters of the basin cannot be evaluated fully exclusively by the biochemical oxygen demand test; therefore, each industrial waste problem shall be considered individually and treatment shall be required as needed to effect compliance with the water quality criteria established for the various classifications of waters in the basin. Treatment standards set by these regulations are the minimum acceptable for the Hackensack River Basin. (Gallagher-Florida)
W72-00206

REGULATIONS CONCERNING TREATMENT OF WASTEWATERS, DOMESTIC AND INDUSTRIAL SEPARATELY OR IN COMBINATION, DISCHARGED INTO THE WATERS OF THE ATLANTIC COASTAL PLAIN, INCLUDING THE ATLANTIC OCEAN.
New Jersey State Department of Environmental Protection, Division of Environmental Quality, Bureau of Water Pollution Control, Trenton, New Jersey, June 1967. 2 p.

Descriptors: *New Jersey, *Atlantic Coastal Plain, *Waste disposal, *Standards, State governments, State jurisdiction, Regulation, Administration, Administrative agencies, Water pollution, Water pollution control, Treatment facilities, Industrial wastes, Waste treatment, Domestic wastes, Water pollution sources, Legal aspects, Biochemical oxygen demand.

This regulation specifies the treatment required of industrial and domestic wastes prior to discharge into the waters of the Atlantic Coastal Plain. The Atlantic Waters are classified into five categories with permissible waste discharge standards provided for each. The standards call for reductions in biochemical oxygen demand of both industrial and domestic wastes ranging from 85% to 95% below the level of untreated waste, depending upon the classification of the receiving waters. The regulation recognizes that the pollution load imposed upon the waters of the Plain cannot be evaluated fully by the biochemical oxygen demand test; therefore, each industrial waste problem shall be considered individually and treatment shall be required as needed to effect compliance with the water quality criteria established for the various classifications of waters in the Plain. Furthermore, all treatment standards established by these regulations are designated as minimum, and more intensive treatment shall be provided whenever the State Department of Environmental Protection deems necessary. (Horwitz-Florida)
W72-00208

REGULATIONS CONCERNING TREATMENT OF WASTEWATERS, DOMESTIC AND INDUSTRIAL, SEPARATELY OR IN COMBINATION, DISCHARGED INTO THE WATERS OF THE WALLKILL RIVER BASIN.
New Jersey State Department of Environmental Protection, Division of Environmental Quality, Bureau of Water Pollution Control, Trenton, New Jersey, November 1967. 2 p.

Descriptors: *New Jersey, *Water quality control, *Standards, *River basins, Water quality, Water pollution, Water pollution control, Pollution abatement, Industrial wastes, Domestic wastes, Administrative agencies, Waste water treatment, Legal aspects, Legislation, Regulation, Biochemical oxygen demand.

Prior to discharge into waters of the Wallkill River Basin, all domestic wastes, separately or in combination with industrial waters, shall be treated to a degree providing, as a minimum, ninety-five percent of reduction of biochemical oxygen demand at all times including any four-hour period of a day when the strength of the wastes to be treated might be expected to exceed average conditions. All industrial wastes discharged into waters classified as FW-2 or FW-3 shall be treated to a degree providing, as a minimum, ninety-five percent reduction of biochemical oxygen demand. It is recognized, especially in connection with some industrial wastes, that the pollution load imposed upon the waters of the basin cannot be evaluated fully exclusively by the biochemical oxygen demand test; therefore, each industrial waste treatment problem shall be considered individually and treatment shall be required as needed to meet established standards. Treatment standards set by these regulations are the minimum acceptable for the Wallkill River Basin. (Gallagher-Florida)
W72-00209

REGULATIONS CONCERNING TREATMENT OF WASTEWATERS, DOMESTIC AND INDUSTRIAL, SEPARATELY OR IN COMBINATION, DISCHARGED INTO THE WATERS OF THE PASSAIC RIVER INCLUDING THE NEWARK BAY.
New Jersey State Department of Environmental Protection, Division of Environmental Quality, Bureau of Water Pollution Control, Trenton, New Jersey, February 1967. 2 p.

Descriptors: *New Jersey, *River basins, *Biochemical oxygen demand, *Standards, Water pollution, Water quality, Water quality control, Water pollution control, Pollution abatement, Waste water (Pollution), Waste water disposal, Waste water treatment, Industrial wastes, Domestic wastes, Regulation, Administrative agencies, Legal aspects, Legislation.

Pursuant to their statutory authority, the State Department of Environmental Protection promulgates the following regulations concerning treatment of wastewaters, domestic and industrial, separately or in combination, discharged into the Passaic River Basin. Depending on the classification of the specific waters involved, the regulations require sufficient treatment to provide either eighty or ninety percent reduction of biochemical oxygen demand at all times, including any four-hour period of a day when the strength of the wastes to be treated might be expected to exceed average conditions. The objective of the regulations is to limit biochemical oxygen demand of effluents to either 25 or 50 parts per million depending on the classification of the waters involved. It is recognized, especially in connection with some industrial wastes, that the pollution load imposed upon the waters of the Basin cannot be evaluated fully exclusively by the biochemical oxygen demand test; therefore, each industrial waste problem shall be considered individually and treatment shall be required as needed to effect compliance with the Water Quality Criteria established for the various classifications of waters in the Basin. Treatment standards set by these regulations are the minimum acceptable for the Passaic River Basin. (Gallagher-Florida)
W72-00210

REGULATIONS CONCERNING TREATMENT OF WASTEWATERS, DOMESTIC AND INDUSTRIAL, SEPARATELY OR IN COMBINATION, DISCHARGED INTO THE WATERS OF THE RARITAN RIVER BASIN INCLUDING THE RARITAN BAY.
New Jersey State Department of Environmental Protection, Division of Environmental Quality, Bureau of Water Pollution Control, Trenton, New Jersey, February 1966. 1 p.

Descriptors: *New Jersey, *Water pollution control, *Standards, *Biochemical oxygen demand, Water pollution, Water quality, Water quality control, Pollution abatement, Regulation, Waste treatment, Waste water treatment, Waste water (Pollution), Industrial wastes, Domestic wastes, Effluents, River basins, Legislation, Legal aspects.

The State Department of Environmental Protection promulgates the following regulations concerning treatment of wastewaters, domestic and industrial, separately or in combination, discharged into the waters of the Raritan River Basin. Prior to discharge into waters classified as FW-2 or FW-3, industrial wastes shall be treated to a degree providing as a minimum a ninety percent reduction in biochemical oxygen demand. Treatment of domestic wastes must provide a minimum of eighty percent reduction of biochemical oxygen demand at all times, including any four-hour period of a day when the strength of the wastes to be treated might be expected to exceed average conditions. Industrial wastes discharged into TW-1 waters must receive sufficient treatment to provide an eighty percent reduction of biochemical oxygen demand. I t is recognized, especially in connection with some industrial wastes, that the pollution load imposed upon the waters cannot be evaluated fully exclusively by the biochemical oxygen demand test; therefore, each industrial waste problem shall be considered individually and treatment shall be required as needed to effect compliance with the standards set for the Basin. Treatment standards set by these regulations are the minimum acceptable for the Basin. (Gallagher-Florida)
W72-00211

REGULATIONS CONCERNING TREATMENT OF WASTEWATERS, DOMESTIC AND INDUSTRIAL, SEPARATELY OR IN COMBINATION, DISCHARGED INTO THE WATERS OF THE DELAWARE RIVER BASIN.
New Jersey State Department of Health, Division of Clean Air and Water, Water Pollution Control Program, Trenton, New Jersey, November 1967. 3 p.

Descriptors: *New Jersey, *Delaware River, *Biochemical oxygen demand, *Standards, Regulation, Water pollution, Pollution abatement, Water pollution control, Water pollution sources, Water quality control, Pollutants, Industrial wastes, Domestic wastes, Waste water disposal, Waste water (Pollution), Waste treatment, Waste disposal, Administration, Administrative agencies, State governments, Legal aspects, Public health.

In order to achieve and maintain water quality standards established for the Delaware River Basin, the Department of Health herein promulgates regulations concerning the treatment of waste waters, domestic and industrial, discharged into the River Basin. Domestic and industrial wastes shall be treated to produce a specified minimum of reduction in biochemical oxygen demand at all times, including any four hour period of a day when the strength of the wastes to be treated might be expected to exceed average conditions. The biochemical oxygen demand of effluents shall not exceed a specified amount. Wastes discharged into the main stem of the Delaware River are regulated. Each industrial waste problem shall, however, be considered individually by the Department. The minimum acceptable treatment standards may be increased whenever it is determined by the Department that such treatment is necessary. (Smiljanich-Florida)
W72-00212

TAX TREATMENT OF POLLUTION CONTROL FACILITIES.
Connecticut General Stat Ann secs 12-81 (51), 12-217d, 12-258c, 12-265c, 12-2706, 12-412 (u) (Supp 1971).

Descriptors: *Connecticut, *Taxes, *Treatment facilities, *Industrial wastes, Water pollution, Water pollution control, Legal aspects, Legislation, State governments, State jurisdiction, Waste disposal, Financing, Non-structural alternatives.

Water pollution control structures and equipment acquired after July 1, 1965, for the treatment of industrial wastes before discharge thereof into any waters of the state or into any sewage system emptying into such waters, the primary purpose of

which is the reduction, control or elimination of pollution of such waters certified as approved for such purpose by the water resources commission, qualify for a tax exemption under section 12-81 of the Statutes of Connecticut. Other sections provide that a tax credit shall be allowed against income for any tax year in amount equal to five per cent of the amount expended or incurred during such income year for the construction, rebuilding, acquisition, or expansion of facilities for the treatment of industrial waste, including the planning thereof, approved as such by the water resources commission, provided that such construction, rebuilding, acquisition, or expansion was commenced after January 1, 1967. If the amount of credit provided exceeds the amount of precredit tax, any balance of the credit remaining may be taken in any of four successive income years. (Horwitz-Florida)
W72-00243

WATER POLLUTION ABATEMENT GRANTS TO SUBDIVISION OF THE STATE.
For primary bibliographic entry see Field 06E.
W72-00268

TAX DEDUCTIONS FOR POLLUTION CONTROL FACILITIES.
For primary bibliographic entry see Field 06E.
W72-00271

POLLUTION PLANT EQUIPMENT-TAX BENEFITS.
For primary bibliographic entry see Field 06E.
W72-00273

STUDY OF UNCONVENTIONAL METHODS FOR BRINE CONCENTRATION,
Garrett Research and Development Co., La Verne, Calif.
For primary bibliographic entry see Field 03A.
W72-00379

USE AND ABUSE OF NATURAL WATER SYSTEMS,
Rice Univ., Houston, Tex.
A. W. Busch.
Journal Water Pollution Control Federation, Vol 43, No 7, p 1480-1483, July, 1971.

Descriptors: *Waste water (Pollution), *Waste assimilative capacity, *Municipal wastes, *Industrial wastes, *Waste water treatment, Water pollution treatment, Economic efficiency, Economic justification.
Identifiers: *Regional treatment, Natural water systems.

Abuse of water systems arises primarily from intentional pollution for maximum use of stream assimilative capacity and from the promotion and development of regional treatment systems. When the amount of pollution available for discharge did not exceed the amount that would significantly reduce the stream's quality parameters, intentional discharge may have been justifiable. The situation now, however, is one of maximizing pollutional discharges under the guise of fully utilizing stream assimilative capacity. The result of following this intentional discharge policy is the present estimate of billions of dollars for clean-up. The second source of water system abuse, regional treatment plants, is usually defended as an economic and efficient way of treating wastes. Nevertheless, the following factors mitigate against regional waste treatment: (1) Proper process design may be overlooked because systems selection is made on a predetermined basis, (2) industrial water reuse costs may increase because of increased transport costs, (3) different reaction rates between wastes may force contributors of rapidly degradable wastes to pay for a disporoportionate amount of residence time, and (4) taxpayers may find themselves paying off bond issues on abandoned municipal facilities that are still usable. (Settle-Wisconsin)
W72-00380

BIOLOGICAL--GAMMA-RADIATION SYSTEM FOR SEWAGE PROCESSING,
Energy Systems, Inc., Melbourne, Fla.
L. A. Mann.
Isotopes and Radiation Technology, Vol 8, No 4, p 439-444, Summer, 1971. 4 fig, 1 tab, 4 ref.

Descriptors: *Sewage effluents, *Sewage treatment, *Economic justification, *Cobalt, *Radiation, Costs, Sewage bacteria, Algae, Coliforms, Insecticides.
Identifiers: *Biological--gamma-radiation system, Modular system, Cobalt-60.

A biological--gamma-radiation method for purifying sewage was developed, and both a pilot and commercial plant were designed, constructed, and tested. The plant design incorporates several modules including a wet wall, a biological treatment unit, an irradiator, a primary filter system, and an activated-charcoal (polishing) filter. At different flow rates on normal sewage, tests indicate that almost all coliform bacteria were killed, and both biodegradable and nonbiodegradable detergents were more than 90% destroyed. Limited tests on Parathion in water resulted in 25-30% destruction of this insecticide. There is some indication that algae will not grow in the effluent. Furthermore, settleable-solids concentration and turbidity were decreased, and a satisfactory BOD level was maintained in the two plants. The cost of building and operating a plant using a biological--gamma-radiation system depends on the quality of water desired and the modules selected for the plant. Estimates indicate that the cost of treatment plants consisting of a conventional secondary treatment plus irradiator and primary filtration modules is less than the cost of conventional advanced-treatment plants. (Settle-Wisconsin)
W72-00383

MULTISTAGE MARGINAL COST MODEL OF INVESTMENT-PRICING DECISIONS: APPLICATION TO URBAN WATER SUPPLY TREATMENT FACILITIES,
Cornell Univ., Ithaca, N.Y. Dept. of City and Regional Planning.
For primary bibliographic entry see Field 06C.
W72-00386

FEASIBILITY OF COMPUTER CONTROL OF WASTEWATER TREATMENT.
American Public Works, Associated, Chicago, Ill.

Copy available forom GPO Sup Doc as EP 2.10:17090 DOY, $1.00; microfiche from NTIS as PB-203 962, $0.95. Water Pollution Control Research Series, December 1970. 77 p, 14 fig, 6 tab, 41 ref. EPA Program 17090 DOY, Contract 14-12-580.

Descriptors: *Automatic control, *Digital computers, *Instrumentation, Automation, Data collections, Sampling, Monitoring, Data transmission, Operation and maintenance, Personnel, Technical feasibility, Economic feasibility, *Waste water treatment.

A wastewater treatment study was conducted to: (1) analyze the advantages and limitations associated with the use of computers in the management and control of wastewater treatment facilities; (2) document potential applications and utilization procedures; and (3) recommend further research to achieve full computer implementation for wastewater treatment operations and associated management functions. Current problems and procedures were surveyed, including site visits to plants already automated to some extent. In addition, manufacturers were queried as to the availability of the monitoring and controlling equipment needed. Results indicated that management is indeed interested in automatic controls and computer application, but that both will come about largely on a piecemeal basis. Computer hardware and communication equipment is available and is already being utilized in many instances, buy many on-line sensing instruments are not available. (Lowry-Texas)
W72-00408

REDUCTION OF SALT CONTENT OF FOOD PROCESSING LIQUID WASTE EFFLUENT,
National Canners Association, Berkeley, Calif. Western Research Lab.
Walter A. Mercer, and Jack W. Ralls.
Copy available from GPO Sup Doc as EP 2.10:12060 DXL, $0.55; microfiche from NTIS as PB-203 963, $0.95. Water Pollution Control Research Series, January, 1971. 45 p, 10 fig, 16 tab, 6 ref. EPA Proj: 12060 DXL.

Descriptors: *Desalination, *Industrial wastes, *Canneries, Ion exchange, Anions, Cations, Activated carbon, Adsorption, Separation techniques, Filtration, Sampling, *Waste water treatment, Liquid wastes.
Identifiers: *Regeneration, Carbonation.

Olive processing brines containing 0.05 to 0.7% sodium chloride were passed through a mixed bed of cation and anion exchange resins in a process known as the Aqua-Ion process. Influent pH, salt content, and COD levels were the particular variables of interest investigated. Sodium chloride levels of 500 to 7000 ppm were subjected to random variations in pH and COD levels, with 94% removal being obtained at 2700 ppm, the optimum for the ranges investigated. Holding pH and COD constant, sodium chloride levels were varied between 600 and 6000 ppm, with resulting effluent concentrations of 150 ppm for influent concentrations of 600, 1000, and 2700 ppm. Influent concentration of 6000 ppm resulted in an effluent concentration of 790 ppm. Calcium hydroxide regeneration was used, with the regenerant being repeatedly cycled through the resin bed to establish the maximum salt concentration attainable in the regenerant effluent. Levels of 3000 ppm were obtained with no indication of leveling off. Pretreatment with activated carbon reduced distributor deposit formation, enabling possible flow rates of 10,000 gpd. Cost analyses based on pilot plant information predicted a cost of 26 cents per 1000 gallons treated. (Lowry-Texas)
W72-00409

EFFECTS OF RADIATION ON TEXTILE WASTES AND STARCH SOLUTIONS,
Auburn Univ., Ala.
John D. Crane.
Master's Thesis, Auburn University, August 1969. 50 p, 16 fig, 9 tab, 21 ref. OWRR A-012-ALA (1).

Descriptors: *Textiles, *Industrial wastes, *Irradiation, Gamma rays, Cobalt, Electromagnetic waves, Biochemical oxygen demand, Chemical oxygen demand, Oxygen, Nitrogen, Chemical degradation, Tertiary treatment, *Waste water treatment.
Identifiers: *Organic compound breakdown, *Electrons, *Photons, Starch.

The effect of gamma radiation from a Cobalt 60 source on desize material and starch solutions from textile finishing operations was studied on a laboratory scale. Variables of interest included radiation dose rate, total radiation dosage, the presence of oxygen and nitrogen in the sample during irradiation, and the initial BOD concentration of the waste. Waste solutions of from .01 to 1.0% were irradiated, and significant BOD reductions were observed for both BOD and COD when the initial BOD concentration was less than 1500 ppm. A maximum BOD reduction of 75% occurred at 60 ppm initial BOD concentration for the starch solution and 350 ppm for the textile desize solution. Total irradiation dosage was observed to have a pronounced effect on solutions of lower initial BOD concentration, with BOD reductions increasing with reduced total dosage. This system may well find application as a tertiary polishing device, but further testing is needed. (Lowry-Texas)
W72-00410

DISINFECTION OF ALGAL LADEN WATERS,
Notre Dame Univ., Ind.
Wayne F. Echelberger, Jr., Joseph L. Pavoni, Philip C. Singer, and Mark W. Tenney.
Journal of the Sanitary Engineering Division, Proceeding of ASCE, Vol 97, No SA 5, October, 1971. p 721-730, 9 fig, 10 ref.

Descriptors: *Chlorination, *Algae, *Photosynthesis, Solubility, Chemical oxygen demand, Biochemical oxygen demand, Filtration, Disinfection, Flocculation, *Waste water treatment.
Identifiers: *Lysis, *Contact time, Cellular metabolites.

Batch laboratory scale experiments were used to demonstrate the effect of algae on the chlorination process. Total chlorine residuals were measured by the standard ortho tolidine procedure. Standard jar test flocculation studies using chlorine and a cationic polyamine as coagulants were also conducted. Results indicated that algal cells do exert a chlorine demand, and as the algal concentration increases, the chlorine dosage required to maintain a certain free residual level increases. Cellular chlorophyll fractions of the algae were reduced by chlorine disinfection, resulting in impairment of the photosynthetic capability of the sludge. Apparent algal cell lysing a cellular metabolite leakage following chlorination to a desirable residual level significantly increased the soluble organic concentration of the suspending medium. From the algae removal standpoint, chlorination did enhance flocculation, probably because some of the cellular metabolites released were natural algal flocculants. Widespread usage of chlorination for disinfection may soon require algae removal prior to disinfection to insure adequate disinfections. (Lowry-Texas)
W72-00411

INACTIVATION OF VIRUS IN SEWAGE,
Johns Hopkins Univ., Baltimore, Md. Dept. of Environmental Health Engineering.
Vincent P. Olivieri, Thomas K. Donovan, and Kazuyoshi Kawata.
Journal of the Sanitary Engineering Division, Proceeding of ASCE, Vol 97, No SA 5, October 1971. p 661-673, 8 fig, 3 tab, 6 ref.

Descriptors: *Virus, *Viricides, *Chlorination, Chlorine, Disinfection, Domestic wastes, Sampling, Hydrogen ion concentration, Water quality control, Waste water treatment.
Identifiers: *Viral inactivation rate, *Chlorine intermediates.

A laboratory scale study was conducted in an attempt to determine the predominant mechanism of viral inactivation by chlorine. Three hypotheses were advanced for investigation: (1) free chlorine is present in the reacting system, but for such a short time that special techniques are necessary to detect it; (2) viral inactivation is due to short -lived chlorine derivatives having viricidal activity; (3) free chlorine is the viricidal agent, requiring only initial contact with subsequent inactivation occurring over a period of time. A rapid reaction sampling system was used, and the effects of pH and varied reaction conditions were noted and recorded. Data strongly supporated free chlorine as the required agent for viral inactivation. The viricidal activity of chlorine at different pH levels correlated better with the persistance of free chlorine than with the theoretical percent HOCl present. The main role of pH was shown to be that of control of chlorine wasting side reactions. (Lowry-Texas)
W72-00412

ANAEROBIC DIGESTION OF SLUDGES CONTAINING IRON PHOSPHATES,
Williams and Works, Grand Rapids, Mich.
Sudershank Malhotra, Alan G. Hartenstein, and Thomas P. Parrilo.
Journal of the Sanitary Engineering Division, Proceedings of ASCE, Vol 97, No SA 5, October 1971. p 629-646, 1 fig, 4 tab, 26 ref.

Descriptors: *Phosphates, *Chemical precipitation, *Iron, *Anaerobic digestion, Activated sludge, Lime, Flocculation, Alkalinity, Hydrogen ion concentration, Organic loading, *Waste water treatment, Sludge treatment.
Identifiers: *Primary sludge, *Digester supernatant recycle, Phosphate release, Phosphate uptake, Digester gas.

One possible method of phosphate removal from municipal wastewater is the precipitation of ferric phosphate brought by the addition of waste pickle liquor from a steel mill. Laboratory digestion studies were performed to determine the effect of such a ferrous sludge on anaerobic digestion, and also to determine the effect of supernatant recycle on phosphate removal efficiency. pH, alkalinity, volatile acids and the percentage of volatile matter reduction in the test digesters were quite normal, and similar to conditions in the control digesters. Ferrous iron in the feed sludge up to 5.55% Fe (dry solids basis) did not upset the gas mixed primary digester or the overall digestion process. Quantity and quality of digester gas was unchanged except for a slight decrease in CO2 content, due to the addition of lime to enhance flocculation. A significant phosphate release occurred on the anaerobic digestion of waste activated sludge containing high amounts of ferrous-iron precipitated phosphates, while a significant phosphate uptake was observed on the digestion of primary sludge containing ferrous iron precipitated phosphates. Therefore, phosphate removals can be enhanced by bulk precipitation of phosphorus with cation addition to existing plants without either expensive alterations or adverse system effects. (Lowry-Texas)
W72-00414

PHOSPHATE REMOVAL BY PH CONTROLLED LIME DOSAGE,
Anne Arundel County Dept. of Public Works, Glen Burnie, Md.
G. Spohr, and A. Talts.
Public Works, Vol 101, No 7, July 1970. p 63-66, 2 fig, 2 tab.

Descriptors: *Waste water treatment, *Phosphates, *Lime, Iron compounds, Aluminum, Hydrogen ion concentration, Biochemical oxygen demand, Chemical oxygen demand, Turbidity, Tertiary treatment, Automatic control.
Identifiers: *Removal, Suspended solids.

Phosphates can be removed from wastewaters by either of two generally different approaches, a tertiary stage of chemical precipitation and removal or a combined chemical-biological process. The cost advantages of the second approach have prompted a great deal of study in this area. A program has been undertaken to evaluate the potential applications of these phosphate removal processes to specific secondary treatment plants. Initial jar-testing considered all possible chemical additives, lime, aluminum salts, iron salts, and polymers. A full scale plant test was conducted at the Patuxent Rives Basin Waste water Treatment Plant of a pH controlled lime dosage system for phosphate removal. The conclusions of this test were: (1) lime slurry addition to wastewater prior to primary sedimentation can be effectively accomplished; (2) total phosphate removal is possible and practical using this process, the efficiency of removal being based on the characteristics of the raw sewage and the lime dosage; (3) suspended solids, BOD and COD are reduced in proportion to the lime dosages; (4) the limitation of this process are established by the adaptibility of the biological treatment stage; and, (5) further study, using other chemicals, should be initiated to avoid the limitations in 4 above. Tertiary treatment is warranted if these limitations cannot be circumvented. (Goessling-Texas)
W72-00415

DETERMINATION OF SODIUM IN BLACK LIQUOR USING A SELECTIVE ION ELECTRODE,
St. Regis Paper Co., West Nyack, N.Y.
C. C. Swasey.
Technical Association of the Pulp and Paper Industry, Vol 53, No 9, September 1970. p 1692-1694, 2 fig, 3 tab.

Descriptors: Water quality control, Industrial plants, Pulp and paper industry, Sodium, Chemical analysis, Measurement, Spectrophotometry, Flame photometry, Hydrogen ion concentration, *Electrodes, Permselective membranes, Temperature, *Ionization, Waste water treatment, Pollutant identification.
Identifiers: *Sulphate pulping, Black liquor, *Selective ion electrode method.

In the evaluation and control of the kraft pulping and recovery processes, the ability to make a rapid deterination of the sodium content of the pulping liquors, especially black liquors, is important. The generally accepted method, flame spectrophotometry, is too slow, requiring at least an hour for each sample. The recent commercialization of selective ion electrodes offers the possibility of obtaining rapid, accurate and automated analysis of the various ionic species in black liquor simultaneously. The sodium ion electrode like other selective ion electrodes, is similar in operation to a conventional pH electrode because it develops a potential across a glass membrane in proportion to the ionic activity of the test solution. The electrode is filled with a solution of fixed sodium ion activity and has an internal silver-silver chloride junction providing a stable potential. Thus, changes in electrode potential are caused only by changes in the sodium ion activity in the sample. If adequate attention is given to controlling operating parameters, such as pH, temperature and ionic strength of the test solution, it is possible to make these determinations as simple as a routine pH measurement. (Goessling-Texas)
W72-00416

NOMOGRAPH SOLUTION OF HEAT REQUIREMENTS FOR DIGESTERS.

Public Works, Vol 101, No 6, June 1970. p 68-69, 1 fig, 1 tab.

Descriptors: *Sludge digestion, *Temperature, Heat, Heat balance, *Waste water treatment.
Identifiers: Nomograph, Sludge volume index, Pounds per capita day, British thermal unit, *Digesters.

To determine the heat requirements for a sludge digester, 3 elements of the problem must be considered: (1) heat required to raise the sludge addition to the digester temperature; (2) compensation for heat losses through the roof and walls of the digester; and, (3) compensation for heat losses during transfer of sludge from the heat source to the digester. A nomograph has been developed to allow rapid calculation of the heat required to raise the sludge additions to the digester temperature. To use this diagram, three variables must be known: the percent solids in the sludge; the solids added (in pounds per capita day); and, the temperature difference between the added sludge and the digester. With these data, the heat required in btu/hour/1000 population can be quickly determined. This value can be multiplied by 24 and the population, in thousands, to obtain the heat required per day. A table is provided to allow and estimate the heat losses in element 2 above. Heat losses due to element 3 above are neglible if relatively short runs are needed to pipe the heated sludge to the digester. This procedure allows a quick evaluation of the heat required to maintain sludge digester temperature. (Goessling-Texas)
W72-00417

PROBLEMS IN OBTAINING ADEQUATE SEWAGE DISINFECTION,
California State Dept. of Public Health, Berkeley.
Harvey F. Collins, Robert E. Selleck, and George C. White.
Journal of the Sanitary Engineering Division, Proceedings of ASCE, Vol 97, No SA 5, October 1971. p 549-562, 10 fig, 23 ref.

Descriptors: *Chlorination, *Disinfection, *Mixing, Baffles, Coliforms, Bactericides, Stratification, Flow rates, Ammonia, *Waste water treatment.
Identifiers: *Plug flow, *Backmixing, Contact time, Chloramines.

Lack of attention to mechanism fundamentals has resulted in inefficient disinfection by chlorine in many instances. The popular gross criterion based on basin volume and flow rate has resulted in basins being of many different shapes, and having no initial mixing. These and other factors have made resultant disinfections entirely unreproducible. For example, in two reactors (one approaching plug flow and the other approaching complete backmixing) having the same volume and being subjected to the same flow rate, the extent of disinfection varies by nearly 4 orders of magnitude. From these studies, plug flow was found to be the optimum flow pattern for chlorine disinfection, with initial mixing playing an important part. Large concentrations of ammonia in the water used to form the chlorine feed solution had no detectable effect on disinfection efficiency. Survival rates of coliform bacteria in chlorinated wastewater never follow Chick's Law, since the 'kill' versus time curve appears to approach a straight line on log-log paper. Overall results of the study indicate that amperometric chlorine residuals and contact time can be used to control the efficiency of wastewater chlorination only when process design factors affecting initial mixing and residence time are ideal. (Lowry-Texas)
W72-00419

IMPLICATIONS OF NITROGENOUS BOD IN TREATMENT PLANT DESIGN,
New York State Dept. of Environmental Conservation, Albany. Div. of Pure Waters.
Russel C. Mt. Pleasant, and Warren Schlickenrieder.
Journal of the Sanitary Engineering Division, Proceedings of ASCE, Vol 97, No SA5 October 1971. p 709-719, 5 fig, 1 tab, 9 ref.

Descriptors: *Biochemical oxygen demand, *Nitrification, Nitrates, Ammonia, Water quality control, Chemical oxygen demand, Hydrogen ion concentration, Nitrogen, Legislation, New York, Waste assimilative capacity, Waste water treatment, *Treatment facilities, Design.

The discharge of treated effluent laden with nitrates has finally been taken into account in the long-term stream degradation picture. 5 day BOD's of treatment plants may average 30 mg/l, whereas the long-term 28 day BOD, may actually range from 135 to 180 mg/l, depending upon the concentrations of nitrates and ammonia present. In recognition of this fact, the State of New York, Division of Pure Waters has commissioned stream surveys and assimilation studies in an effort to assess the extent of damage caused at various places attributable to the Nitrogenous Oxygen Demand. A reevaluation of previous key studies was also conducted in the light of the contribution of the N.O.D. A summary of six different communities, the nature of their waste problems, and a brief description of the solutions is included. (Lowry-Texas)
W72-00420

HYDROLYSIS OF LIPIDS IN WASTEWATER,
New Mexico State Univ., University Park.
Gary R. Kramer.
Journal of the Sanitary Engineering Division, Proceedings of ASCE, Vol 97, No SA 5, October 1971, p 731-744. 7 fig, 2 tab, 51 ref.

Descriptors: *Lipids, *Hydrolysis, *Biodegradation, Microorganisms, Solvation, Chemical degradation, Oil, Electrolysis, Separation techniques, Data collection, *Waste water treatment.
Identifiers: *Endogenous growth phase, Fatty acids, Grease, Batch reactors.

Duplicate well-mixed batch reactors were constructed and operated to determine the role of hydrolysis in the removal of lipids by microorganisms present in a domestic waste. In each system, one reactor contained emulsified oil substrate, and the other contained emulsified fatty acid products of chemical hydrolysis of the oil. It was determined that hydrolysis did not limit the rate of lipid removal for organisms in primary clarifier effluent. However, hydrolysis did limit the rate of removal of a fraction of the grease by organisms which had been grown in a laboratory fill-and-draw batch reactor. The fraction resistant to removal was believed to be a monoglyceride, probably beta-monoglyceride. Hydrolysis of glycerides at the alpha-position was not rate limiting in either biosystem studied. Reduced enzyme activity in starved cultures, such as the stabilization portion of a contact stabilization treatment scheme, was believed to be the cause of lipid and oxygen uptake limitations which occurred when microorganisms in the endogenous phase were used. (Lowry-Texas)
W72-00421

CHLORINATION DYNAMICS IN WASTEWATER EFFLUENTS,
Techion - Israel Inst. of Tech., Haifa (Israel). Sanitary Engineering Lab.
Yehuda Kott.
Journal of the Sanitary Engineering Division, Proceedings of ASCE, Vol 97, No SA 5, October 1971, p 647-659. 2 fig, 10 tab, 17 ref.

Descriptors: *Chlorination, *Disinfection, *Oxidation lagoons, Coliforms, Algae, Temperature, Analytical techniques, Water quality control, *Waste water treatment.
Identifiers: *Cysts, Israel.

The response of coliforms, Endamoeba histolytica cysts, and algae to chlorination was investigated on a laboratory scale. Effluent used was obtained from a trickling filter plant, and from an artificial oxidation pond. Application of 8 mg/l of chlorine to the trickling filter effluent reduced the coliform count from 10 to the 7th power organisms per 100 ml to less than 100 organisms per 100 ml. Application of 14 mg/l actually produced a greater number of coliform organisms in the effluent than was noticed for the 8 mg/l dosage. The probable cause was assumed to be the break-down of organic material and release of entrapped coliform organisms. Application of the 8 mg/l dosage to solutions containing the Endamoeba histolytica cysts also produced a rapid and thorough kill, although the death rate was quite temperature dependent. Algae was unaffected for a two hour interval, except for the cessation of growth. Since the chlorine did not attack the algae for 2 hours, much longer than the normal contact time, then, chlorination should be well suited for disinfection of oxidation pond effluent. (Lowry-Texas)
W72-00422

ADSORPTION OF SULFUR CONTAINING TASTE AND ODOR COMPOUNDS ON ACTIVATED CARBON,
Maryland Univ., College Park. Water Resources Research Center.
Chanel Ishizaki, and John T. Cookson, Jr.
Preprint of paper presented at Water Pollution Control Federation Conference, 44th, Session 5, No 5, October 4, 1971. 21 p, 5 fig, 2 tab, 11 ref.

Descriptors: *Activated carbon, *Adsorption, *Sulfur compounds, Taste, Odor, Catalysts, Oxidation, Separation techniques, Analytical techniques, Gas chromatography, Isotherms, Hydrogen ion concentration, Temperature, *Waste water treatment.
Identifiers: *Mercaptans, *Disulfide.

Adsorption characteristics of mercaptan and disulfides on activated carbon were studied. Components studied included n-butylmercaptan and butyldisulfide. Investigations were conducted in glass vials supplied with 'mininert' teflon sealing valves under controlled conditions of mixing, temperature, pH, and ionic strength. A Perkin-Elmer Model 900 gas chromatograph was used for the analytical determinations. Analysis of the data demonstrated that the adsorption kinetics could be described by a reversible second order equation, first order with respect to both mercaptan and carbon concentration. Lowering the pH enhanced mercaptan adsorption, probably a result of the increase of molecular species and the decrease of the carbon's negative charge. In the presence of oxygen, activated carbon catalyzes the oxidation of the mercaptan to a disulfide, with hydroquinones and quinones on the carbon surface proposed as the catalytic sites. Surface oxide removal at 400 deg, and 800 deg increased the carbon's capacity for the disulfide by 30% and 40% respectively, probably accounted for by less hydrogen bonding of water. (Lowry-Texas)
W72-00423

TREATMENT OF WASTEWATERS BY PULSED ADSORPTION BEDS,
Iowa State Univ. of Science and Technology, Ames.
Robert L. Johnson.
Doctoral Dissertation, 1969. 226 p, 38 fig, 34 tab, 42 ref. OWRR A-025-IA (1).

Descriptors: *Adsorption, *Biodegradation, *Filtration, Separation techniques, Head loss, Reynolds number, Aeration, Bubbles, Oxidation, Pilot plants, Cost analysis, *Waste water treatment.
Identifiers: *Concentration gradient, *Interfaces, *Solids separation.

A physical-chemical adsorption of organic material onto the surface of granular media has shown promise as a wastewater treatment method. The Pulsed Adsorption Bed (PAB) creates a much higher concentration of organic material at the media-waste-water interface resulting in further rapid oxidation and assimilation of organic material. Use of PAB units only provides removal of the portion of organic material which is oxidized, whereas a PAB-solids separation system (such as multi-media filters) would provide removal of both the oxidized portion and portion synthesized into new cells. Organic material removals of 77% were obtained with only a 36 in. bed depth, and consistent 70-90% removals were considered quite possible. Optimum sand size of 0.5 to 0.6 mm, PAB media depth of 50 to 60 inches, and PAB upward airflow rate of .2 to .4 cfm/ft sq were determined to be optimum operating conditions based on the pilot plant testing. No reduction in phosphates or the oxygen demand due to nitrification was observed. Annual operation cost estimates for a 10 mgd PAB-solids separation system were 3.5 cents/1000 gal, as compared to 6.6 to 8.3 cents/1000 gal required for activated carbon adsorption of the same flow. (Lowry-Texas)
W72-00425

CATTLE FEEDLOTS AND ALTERNATIVES FOR WASTE MANAGEMENT,
Environmental Protection Agency, Portland, Oreg. Water Quality Office.
For primary bibliographic entry see Field 05G.
W72-00428

AN EXPERIMENTAL VALUATION OF THE INTRA-PARTICLE RESISTANCE IN SUBSTRATE TRANSFER TO SUSPENDED ZOOGLOEAL PARTICLES,
Michigan Technological Univ., Houghton.
C. R. Baillod, and W. C. Boyle.
Proceedings, Industrial Waste Conference, 24th, May 6, 7, and 8, 1969, p 302-326. 15 fig, 1 tab, 21 ref.

Descriptors: *Waste water treatment, *Mass transfer, Limiting factors, Laboratory tests, Oxygen, Temperature, Chemical adsorption, Stabilization, Sampling, Metabolism.

Identifiers: *Substrate metabolism, Glucose, Substrate uptake, Autoanalyzer, *Zoogloea ramigera, Pure culture.

Wastewater contains particulate and soluble organic materials suspended or dissolved in the carriage water. These constituents are removed in treatment systems by one of three basic mechanisms: (1) gravity sedimentation; (2) physical sorption onto a solid surface; or, (3) chemical reaction at an active surface. In the latter two, the organic mass must be transferred to the solid surface before stabilization occurs. It is possible that the rate of mass transfer may limit the overall rate of the removal reaction. A study has been conducted to determine experimentally the extent to which the mass transfer process limits soluble organic stabilization by suspended particles of bacterial floc. A pure culture of ZOOGLOEA RAMIGERA, strain I-16-M, was used to insure reproducibility and to limit the number of variables in the experiments. The inoculum for the development of the pure culture floc was prepared on trypticase soy agar. Bacterial floc were grown from the inoculum using a glucose substrate. Matured cultures were washed and placed in a stirred litter reactor and glucose substrate added. Glucose uptake, oxygen uptake and temperature were measured throughout each experiment. Floc size was varied and cells were dispersed in the reactor by blending to determine the effect on substrate utilization. The results indicate that a mass transfer limit is present, but this limit is on the rate of substrate solubilization rather than the rate of assimilation. (Goessling-Texas)
W72-00433

CLARIFICATION OF THE LIME BEARING WASTES FROM A SOLE LEATHER TANNERY,
Cincinnati Univ., Ohio.
J. D. Eye, and L. Liu.
Proceedings, Industrial Waste Conference, 24th, May 6, 7, and 8, 1969, p 349-364. 6 fig, 6 tab, 20 ref.

Descriptors: *Waste water treatment, *Design, Laboratory tests, On-site tests, Operation and maintenance, Sludge disposal, Dewatering, Biochemical oxygen demand, Chemical oxygen demand, Alkalinity, Sulfides.
Identifiers: *Tannery, *Lime-bearing waste water, Anionic polyelectrolyte, Clarifier, Close control, Total solids, Suspended solids.

The tanning industry has been recognized as a major contributor to water pollution due to the highly contaminated nature of the water borne components of the untreated tannery effluents. There are a variety of wastewaters with significantly different characteristics stemming from the different processes required to convert raw hides to finished leather. A large amount of the total contamination comes from the lime vats where hides are prepared for the tanning process. The objective of this study was to find an acceptable means of removing the suspended lime from this wastewater. Preliminary investigations showed that limited removal could be accomplished by plain settling with detention times up to 24 hours. Laboratory tests indicated that the addition of anionic polyelectrolytes at dosages of 10 mg/l were effective in clarifying the lime-bearing fractions of the waste when separated from the non-lime bearing wastes. On-site pilot plant operations verified these findings. A full-scale clarifier for the lime-bearing wastes was constructed and separate sewerage for these wastes emplaced. The operation was not initially successful. A revised sampling and operational schedule, emphasizing close control, resulted in performance close to that predicted. Lime sludge was landfilled without difficulty, and dewatered readily. Total cost for the 100,000 gpd system was $20,000. (Goessling-Texas)
W72-00434

SYSTEMATION IN USING THE ROTATING BIOLOGICAL SURFACE (RBS) WASTE TREATMENT PROCESS,
Environmental Pollution Control, Inc., Oconomowoc, Wis.
R. H. Joost.
Proceedings, Industrial Waste Conference, 24th, May 6, 7, and 8, 1969, p 365-375. 8 fig, 3 ref.

Descriptors: *Waste water treatment, Aerobic conditions, Trickling filters, Design, Fabrication, Activated sludge, Biochemical oxygen demand, Municipal wastes, Industrial wastes, Maintenance and operation, Capital costs, Electric power, Biological treatment.
Identifiers: *Rotating biological surface, Volatile suspended solids, Shock loads.

The rotating biological surface will emerge as a very significant contribution to the waste treatment field. The system comprises closely spaced disks mounted on a shaft so that as the shaft is rotated, the surface of the disk is alternatively emersed in wastewater and exposed to the oxygen in the air. The design insures quick and intimate contact between the biomass on the disk and the organic waste in the water. For domestic wastes, detention time is less than 45 min. for 90% removal of BOD. The biomass on the disks is equivalent to a volatile suspended solids concentration of 17,000 mg/l in an activated sludge plant. The biomass is firmly attached to the disks and wash outs are not likely nor are conditions suitable for the system to become anaerobic as a trickling filters do under overloaded conditions. Capital costs are difficult to estimate but they should be competitive with other processes. Power required should be less than half of that required for conventional activated sludge. Dispersion of the wastes throughout the system is quick and effective. Maintenance and reliability compare favorably with those of other processes. Less operator attention is needed to monitor the process. The system must be enclosed to protect the disks and the biomass from hail, wind and heavy rain, but this can be an advantage. The rotating biological surface is a large step forward in waste treatment. (Goessling-Texas)
W72-00435

TREATMENT BY FREEZING,
Alaska State Dept. of Health and Welfare, College.
A. J. Alter.
Proceedings, Industrial Waste Conference, 24th, May 6, 7, and 8, 1969, p 374-383. 1 fig, 2 tab, 30 ref.

Descriptors: *Waste water treatment, *Water treatment, *Freezing, Desalinization, Sludge treatment, Cold regions, Chemical, Biological treatment, Data collection, Resource development.
Identifiers: Temperature sensitivity, Physical processes.

Freezing may be one of the most useful processes for conditioning water and wastewater. Surprisingly little is known about details of the process and even less is known about applying the process to water and waste treatment. Cold is a significant resource available for use throughout a large portion of the land mass of the northern hemisphere. A low temperature view point is necessary for full understanding of the limits of applicability of conventional processes. Almost all biological, chemical and physical processes employed in environmental control are temperature sensitive. A summary of existing knowledge on the freezing process to desalinate brine and condition sludge is presented. Examples of the possible mechanizations of the process are given. There is a serious need for further investigation and application of the freezing process in conditioning water and wastes. A better understanding of the principles and methodology for use of the freezing process in water and wastewater conditioning promises to lend needed perspective to temperature climate practice and provide a more realistic reservoir of information to be used in meeting domestic and industrial waste management needs in the burgeoning North. As we build communities, extract resources and permanently occupy cold regions, we must learn the secrets of our new environment. (Goessling-Texas)
W72-00436

TREATMENT OF WASTES FROM MEAT FLOUR FACTORIES,
Ruhrverband, Essen (West Germany Development Division).
I. R. Born.
Proceedings, Industrial Waste Conference, 24th, May 6, 7, and 8, 1969, p 384-401. 13 fig, 1 tab, 17 ref.

Descriptors: *Waste water treatment, *Industrial wastes, Activated sludge, *Trickling filters, Biochemical oxygen demand, Effluents, Biological treatment.
Identifiers: *Meat flour factories, Meat packing plants, Animal carcasses, Inclined trickling filters, Clarifiers, Biomat, Oxidation ditches, Multi-stage treatment, Stream assimilation, Germany.

In Germany, the prompt removal and treatment of animal carcasses is required by law in accord with sanitary considerations. Usually these carcasses are processed to provide meat flour which is used as a fodder. After discussion of the special operating conditions of meat flour factories from the sanitary view, the possibilities of biological wastewater treatment are explained in detail. For a single stage biological treatment only the activated sludge process is suitable. 'Biomat' and the activated sludge ditch are good adaptations of this treatment process. Trickling filters using synthetic agents are shown to be very economical for primary partial treatment. Furthermore, the European development of the shape of the filling elements and the future development of the inclined rotary trickling filter are discussed. Two and three stage treatment plants are presented with various arrangements of processes to provide the necessary degree of treatment. In Germany, the relevant authorities demand effluent concentrations of about 25 mg/l BOD for organic pollution. These standards must be adjusted to total pollutional loads on the receiving waters as streams approach their assimilative capacity. As meat flour plants expand, the efficiency of the wastewater treatment must be increased to maintain an acceptable BOD loading of the stream. (Goessling-Texas)
W72-00437

HYDRAULIC AND PROCESS ASPECTS OF REACTOR DESIGN, II-RESPONSE TO VARIATIONS,
Amoco Chemicals Corp., Whiting, Ind.
J. C. McClellan, and A. W. Busch.
Proceedings, Industrial Waste Conference, 24th, May 6, 7, and 8, 1969. p 493-506, 9 fig, 1 tab, 14 ref.

Descriptors: *Activated sludge, *Forecasting, *Effluents, *Waste water treatment, Biochemical oxygen demand, Laboratory tests, Economic analysis, Biological treatment.
Identifiers: Hydraulic detention time, Batch reaction time, Reaction potential, Available reaction potential, Shock loads.

Current design procedure for the activated sludge biological waste treatment process is based on steady state analysis. It would be advantageous to be able to predict the effluent quality under actual waste loading conditions. Accordingly, a study was conducted to determine the Batch Reaction Time, the time necessary for a given concentration of MLSS to reduce a given concentration of available carbon to zero. This allows the designer to calculate the total available Reaction Potentials (the total available carbon a unit mass of microorganisms can reduce in a given time) and the Available Reaction Potential (the difference between the Reaction Potential and the influent available carbon concentration). If the influent soluble organic carbon exceeds the Reaction Potential or the change in the influent concentration exceeds the

Available Reaction Potential, then effluent quality is degraded. The Reaction Potential of the process will be exceeded any time the Batch Reaction Time exceeds the hydraulic detention time. It is now possible to quantify the ability of a mixed microbial culture in a recycle reactor to handle quantitative shock loads. We can predict whether an increase in loading will cause an increase in effluent organic content but we cannot yet predict the extent of the increase because of the effects of physiological changes which result. (Goessling-Texas)
W72-00439

ANAEROBIC LAGOONS VERSUS AERATED LAGOONS IN THE TREATMENT OF PACKING-HOUSE WASTES,
Tennessee State Dept. of Public Health, Nashville.
J. W. Saucier.
Proceedings, Industrial Waste Conference, 24th, May 6, 7, and 8, 1969. p 534-541, 2 fig, 3 tab, 1 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Lagoons, Aerobic conditions, Anaerobic conditions, Trickling filters, Biochemical oxygen demand, Pretreatment, Activated sludge, Capital costs, Economic analysis.
Identifiers: Packing plants, Suspended solids, Grease.

Tennessee does not have many large meat-packing industries. Most of this type plants are small operations located in relatively small communities. In most instances the wastes from the meat-packing industries are treated in combination with the domestic wastes. The typical wastes from animal slaughtering and meat-packing operations have a very high concentration of BOD, suspended solids and grease. Union City, Tennessee constructed an anaerobic lagoon as a pre-treatment process for these wastes prior to receipt at activated sludge plant. The lagoon was designed to have a depth of 10.5 feet and a BOD loading of 15 lb/1000 cu. ft. After 3.5 years of operation, BOD of the effluent averages 100 mg/1 or less and suspended solids 150 mg/1. Cost for the facility is $7/lb BOD removed. Hallsdale-Powell Utility district contracted with the Purity Packing Company to treat the company's wastes and eliminate what had been a bad water pollution problem. A two-cell areated lagoon was designed based on an influent of 565 mg/1 BOD and a flow of 100,000 gpd. Because of the high degree of treatment required and uncertainty regarding the aeration equipment, the facility was over designed. The effluents discharged to the receiving stream average less than 4 mg/1 BOD and 7 mg/1 suspended solids. Costs are $127/lb BOD removed per day. (Goessling-Texas)
W72-00441

A MATHEMATICAL MODEL FOR A TRICKLING FILTER,
Robert A. Taft Water Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
J. F. Roesler, and R. Smith.
Proceedings, Industrial Waste Conference, 24th, May 6, 7, and 8, 1969. p 550-563, 10 fig, 2 tab, 7 ref.

Descriptors: *Mathematical model, *Trickling filters, Biochemical oxygen demand, Capital costs, Operating costs, Maintenance costs, Design, Economic analysis, *Waste water treatment.
Identifiers: *Final settler, Hydraulic loading, Specific surface area, Filter depth.

A mathematical model describing the operation and efficiency of a trickling filter and a final settler has been written as a subroutine for inclusion in the Executive Digital Computer Program. The program computes the effluent and recycle stream characteristics based on the decisions that can be made concerning operation and efficienty of the process. Capital cost and operating and maintenance cost for the trickling filter, the final settler and the return pumps are also computed. The exercise of this model provides the decision maker with a series of curves showing: (1) the per cent BOD removed vs. hydraulic loading as a function of specific surface area of the media; (2) per cent of BOD removed vs. specific surface area as a function of hydraulic loading; (3) the depth of filter required for an 85% BOD removal rate vs. hydraulic loading as a function of specific surface area; (4) cost to remove BOD vs. hydraulic loading as a function of filter depth; (5) cost to remove BOD vs. hydraulic loading as a function of specific surface area with a fixed filter depth; (6) total costs versus per cent BOD removed as a function of recirculation ratios for two specific areas; and (7) capital costs vs. filter depth required for 85% BOD removal as functions of type media, hydraulic loading and specific surface area. (Goessling-Texas)
W72-00442

COMPOSITION STUDIES OF ACTIVATED SLUDGE,
Kentucky Univ., Lexington.
C. E. Burkehead, and S. L. Waddell.
Proceedings, Industrial Waste Conference, 24th, May 6, 7, and 8, 1969. p 576-594, 7 fig, 5 tab, 14 ref.

Descriptors: *Activated sludge, Design, Chemical analysis, Microorganisms, Laboratory studies, Carbohydrates, Proteins, Respiration, Sludge, Waste water treatment.
Identifiers: Batch process, Continuous process, Energy-synthesis relationship, Organic substrates.

In order to expand the ability of sanitary engineering designers and researchers to translate data from batch to continuous activated sludge systems, a series of studies have been conducted to determine the change in chemical composition of activated sludges grown in batch-fed units with pure organic substrate. Energy synthesis data were also taken to more completely define the chemical changes taking place throughout all phases of the growth cycle. Three liter batch reactors were used to grow active biomasses on each of 14 substrates. The VSS were analysed for their chemical composition. The results of these studies are: (1) the composition of activated sludge varies from C_4H_8ON to $C_8H_{15}O_5N$, dependent on the stage of growth and the organic substrate used; (2) carbohydrates are the primary storage products during the growth phase, but storage does not necessarily occur for all substrates; (3) proteins are the primary source of energy during the endogenous respiration phase of sludges grown from carbohydrate substrates; (4) there exists a constant and predictable energy-synthesis relationship. A knowledge of this relationship, coupled with a knowledge of the activated sludge composition, offers a valuable aid to sanitary engineering designers. (Goessling-Texas)
W72-00443

BOD FROM POULTRY PROCESSING PLANTS,
Griffith (L.B.), Falls Church, Va.
C. C. Griffith, and M. L. Rodevick.
Proceedings, Industrial Waste Conference, 24th, May 6, 7, and 8, 1969. p 713-724, 1 fig, 3 tab, 3 ref.

Descriptors: *Waste water treatment, *Poultry, *Design criteria, *Biochemical oxygen demand, Data collection, Correlation analysis, Economic analysis.
Identifiers: Average live weight.

Poultry growing and processing has become an integrated operation with the growing and processing facilities located close together. Whether the wastewaters are treated in municipal plants or on the site the large volume and high strength of the wastes govern plant design. The cost of treatment facilities will be governed principally by the pounds of BOD involved. The criteria generally cited are 6.68 lb BOD/1000 lb live weight or 24 lb BOD/1000 head to be processed. Both criteria call for a fixed amount of BOD/production unit. There is no intrinsic reason why a production unit of small chickens should produce exactly the same BOD as a production unit of large chickens. Data from two previous studies are evaluated and combined to permit a correlation of BOD produced per production unit as a function of average live weight per bird. The correlation is a straight line function which supports the contention that large birds contribute more BOD than small birds per production unit. The available data is not considered to be sufficiently comprehensive to permit precise calculation of BOD loads imposed by larger birds, but it is adequate to raise a warning flag which should alert those involved to the probability that treatment plants designed according to the old criteria may be under designed by a factor of two where four pound birds are being, or soon will be processed. (See also W72-00445) (Goessling-Texas)
W72-00444

DISCUSSION OF 'BOD FROM POULTRY PROCESSING PLANTS',
Federal Water Pollution Control Administration, Athens, Ga. Southeast Water Lab.
D. W. Hill, J. L. Dause, and T. N. Sargent.
Proceedings, Industrial Waste Conference, 24th, May 6, 7, and 8, 1969. p 725-726, 3 ref.

Descriptors: *Waste water treatment, *Poultry, *Design criteria, Biochemical oxygen demand, Data collection, Correlation analysis, Economic analysis.
Identifiers: Average live weight, Turkeys.

The author suggests a correlation between a very significant increase in the waste produced at a chicken processing plant per thousand lb of live weight of birds and the increase of live weight per bird. Although a correlation was obtained from available data in the literature, the data used were 11 to 20 years old. Consideration of partially related data published by the U. S. Department of Agriculture suggests that is more data were available, the author's conclusion might not be substantiated. The major point stressed by both the author and the reviewers is that there is a definite need for a great deal of much more recent data in the literature relating to the poultry processing industry. (See also W72-00444) (Goessling-Texas)
W72-00445

PURIFICATION OF WASTES FROM A GERMAN YEAST PLANT,
Emschergenossenschaft Essen (West Germany): and Lippeverband, Essen (West Germany).
D. Londong.
Proceedings, Industrial Waste Conference, 24th, May 6, 7, and 8, 1969. p 770-788, 12 fig, 3 tab, 6 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Yeasts, Biochemical oxygen demand, Nitrogen, Phosphorous, Activated sludge, Laboratory tests, Temperature, Economic analysis, Effluents, Capital costs, Operation costs, Maintenance costs.
Identifiers: Regional treatment, Digester gas, Germany.

The yeast plant which is the subject of this paper is located on the east border of the Rhenisch-Westphalian industrial district. The wastewater from this plant is piped to a central activated sludge plant in Hamm, about 21 km away. Total flow averages 0.35 mgd and is composed of BOD5 (12,000 kg/working day), total nitrogen (1000 kg/working day) and total phosphorous (120 kg/working day). Initially the pipeline created problems due to gas formation until it was found that reducing the temperature of the wastes from 85 to 75 degrees F. reduced gas production by half. The yeast industry is being strongly challenged by foreign competitors and the cost of wastewater treatment due to unfavorable location of the plant imposes an economic constraint on this facility. In preparation for moving the plant to a more favorable location numerous tests were conducted to determine the most economic form of treatment. It was verified that yeast plant wastes could be treated with a mixture of other industrial and municipal wastes to the economic and technical ad-

vantages of the area served. Aerobic treatment of yeast wastes adds significantly to the total cost of 25 to 40 -DM ($6.25 to $10.00) or four to ten percent of the total production cost of yeast. (Goessling-Texas)
W72-00446

THE COPELAND PROCESS FLUID BED SYSTEM AND POLLUTION CONTROL WORLD WIDE,
Copeland Process Corp., Oak Brook, Ill.
G. G. Copeland.
Proceedings, Industrial Waste Conference, 24th, May 6, 7, and 8, 1969. p 1017-1023. 4 fig, 9 ref.

Descriptors: *Waste water treatment, *Sludge disposal, By-products, Legislation, Pollution abatement, Population, Pulp and paper industry, Economics.
Identifiers: *Copeland process, *Fluid bed reactor, Steam, Japan, Scandanavia.

The Copeland process is a fluidized bed reactor for the combustion of waste materials with a high liquid content with capability for recovering steam, by-products, or reusable materials. BOD removal efficiencies of 99% can be expected with liquid wastes that have a net heat value of 9,900 btu/gal without the use of additional fuels. This process is now being considered in the U. S. for application to a wide variety of wastes, liquid and solids. Japan has a serious population creted pollution problem. The Japanese avidly follow all developments in the U. S. concerning pollution control and legislation. The Iron Curtain countries are increasing their efforts at controlling pollution of the receiving waters. New plants in these countries must include the installation of high efficiency pollution control systems before approval for construction is given. The Scandinavian countries have been doing something about pollution for many years. The impression is that they are doing more work in the pulp and paper industry than other industries but this is only because this is their largest industrial element. The costs of values that can be recovered by pollution control systems, steam, by-products or reuseable materials, vary markedly throughout the world. Any pollution control system must be adaptable to the economic merits. (Goessling-Texas)
W72-00447

THE HYDRAULIC PERFORMANCE OF CHLORINE CONTACT TANKS,
Virginia Military Inst., Lexington.
C. M. Sawyer, and P. H. King.
Proceedings, Industrial Waste Conference, 24th, May 6, 7, and 8, 1969. p 1151-1168, 10 fig, 3 tab, 23 ref.

Descriptors: *Chlorination, *Analytical techniques, Tracers, Performance, Forecasting, Model studies, Waste water treatment.
Identifiers: *Contact tank performance, Methylene blue, Response curves.

For maximum efficiency, future waste treatment units should be evaluated for performance before they are constructed and placed in operation. Tracer studies conducted on hydraulic models is a simple and inexpensive means of investigating the performance of many types of units. This research was devoted to the study of the hydraulic characteristics of chlorine contact tanks and to the relationship of these characteristics to performance. Methylene blue dye was used in these studies and detection was by standard colorimetric equipment. Circular, unbaffled vertical units and conventional rectangular baffled basins were studied in the laboratory and in field work. The response of these tanks were analyzed by conventional methods as well as by dynamic analysis and statistical analysis. The circular tank displayed a large proportion of well mixed flow and from dynamic analysis, the well mixed regime could be modeled by a linear combination of two completely mixed volumes. The rectangular tank produced a dominant plug flow response. Dynamic analysis of the rectangular model suggests that the response could be characterized by a linear combination of four small completely mixed volumes plus a large distance velocity lag time. The optimum chlorine contact tank should possess a particular combination of the hydraulic characteristics of each type of design. A series of contact units may have to be used in order to obtain the desired performance level. (Goessling-Texas)
W72-00448

5E. Ultimate Disposal of Wastes

REHABILITATION OF SOLID INDUSTRIAL WASTES DISPOSAL SITES,
Syracuse Univ., N.Y.
C. S. Grove, Jr., M. L. Kestner, and N. L. Nemerow.
Proceedings, Industrial Waste Conference, 24th, May 6, 7, and 8, 1969. p 1072-1089, 5 fig, 7 tab, 3 ref.

Descriptors: *Solid wastes, *Industrial wastes, *Landfills, *Forecasting, *Survey, Stabilization, Solubility, Leaching, Data collection, By-products, Percolation, Infiltration, Design, Waste disposal.
Identifiers: Magnitude.

Solid wastes arise from many different sources in a large variety of industries. A study has been undertaken to determine the quantity of refuse generated, the physical and chemical properties of the refuse and to study modifications of these properties that will permit useful by-product recovery and beautification of presently barren land where these wastes have been deposited. Data concerning quantities, characteristics and methods of disposal of solid wastes can be obtained by correspondence, literature review and personal interviews with industry officials and waste haulers. National solid wastes projections can be determined for some groups of industries based upon: (1) amount of raw material processes; (2) total number of employees; and (3) percentage share of market the individual plant produces. Studies and experiments that may lead to stabilization of landfills are being undertaken. Development of a theory and experimental design for an industrial waste consisting of soluble mixed in a matrix of insoluble constituents appear very promising. Laboratory studies of infiltration, percolation and leaching of such a mixture have been started. Both theory and design of other mixtures containing compounds requiring a chemical reaction for solubilization in a matrix of highly insoluble components is underway. (Goessling-Texas)
W72-00031

SUBMARINE DISPOSAL OF INDUSTRIAL WASTE,
Montgomery Research Inc., Pasadena, Calif.
C. A. Rambow.
Proceedings, Industrial Waste Conference, 24th, May 6, 7, and 8, 1969. p 1486-1493, 6 fig, 2 ref.

Descriptors: *Waste water disposal, Design, Water quality, Thermocline, Density, *Industrial wastes, Waste disposal.
Identifiers: *Ocean outfalls, *Diffusers.

Disposal of industrial wastewaters through a submarine outfall into the ocean or other large bodies of water can be a satisfactory, economical and trouble free system. Such a scheme is not universally applicable, however,where the wastes can be disposed into the receiving body without violating water quality regulations, it should be a strong contender. A thorough survey of the receiving waters over the extremes of weather and current conditions must be conducted to insure that the wastes can be sufficiently diluted to avoid creating a nuisance or polluting the water. The density of the water in the vicinity of the outfall should be such that wastes can be mixed with it and the resulting combination not rise to the surface. Diffuser design is critical in insuring proper mixing. The parameters affecting design and a design approach are presented and discussed. The interaction of discharge port size, headloss, port spacing, maximum and minimum flows is discussed. The impact of stratification thermocline and salinity on diffuser design is presented. Examples are provided and a few techniques for fabricating and placing outfalls are mentioned. Properly designed wastewater outfalls need not be sources of water pollution. They can provide an economical method of wastewater disposal. (Goessling-Texas)
W72-00041

RULES AND REGULATIONS ESTABLISHING MINIMUM STANDARDS RELATING TO LOCATION, DESIGN, CONSTRUCTION, AND MAINTENANCE OF INDIVIDUAL SEWAGE DISPOSAL SYSTEMS.
Rhode Island State Dept., of Health, Providence.

1968. 21 p.

Descriptors: *Rhode Island, *Sewage disposal, *Regulation, *Water pollution control, Sewage, Construction, Design, Specifications, Septic tanks, Cesspools, Soil disposal fields, Waste disposal, Water pollution sources, Water pollution control, Sewers, Drainage systems, Maintenance, Installation, Subsurface investigations, Subsurface drainage, Percolation, Water table, Legal aspects, Legislation.

Before constructing or improving an individual sewage disposal system, an individual must obtain written consent from the director of health of the plans and specifications for such work. Each application for approval of a sewage disposal system must contain basic data and other specifications, and the use of such a system must conform with the terms of its approval. A new system shall not be covered with earth until the director has inspected it and certified that it is in conformance with the approved terms. At any stage of construction, the director may inspect the installation and require modifications if unanticipated conditions so require. Without an order from the director, any discharge of sewage into any waterbody is prohibited. If a public sanitary sewer is reasonably accessible, an individual system shall not be approved. Other provisions of the regulations control: (1) sewer system maintenance; (2) sewage flow levels; (3) the building of sewers; (4) septic and dosing tanks; (5) distribution boxes; (6) sewage seepage systems; (7) specifications for disposal trenches and beds; (8) seepage pits; (9) cesspools, privies and chemical toilets; (10) subsoil exploration; (11) percolation test procedures; and (12) ground water table elevation determinations. (Gallagher-Florida)
W72-00197

A BILL TO AMEND THE FISH AND WILDLIFE COORDINATION ACT IN ORDER TO PROTECT MARINE ENVIRONMENT BY REGULATING THE DUMPING OF WASTES IN THE COASTAL AND OCEAN WATERS OF THE UNITED STATES.
For primary bibliographic entry see Field 06E.
W72-00292

OCEAN OUTFALL DESIGN: PART I - LITERATURE REVIEW AND THEORETICAL DEVELOPMENT,
Pacific Northwest Water Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 05B.
W72-00356

5F. Water Treatment and Quality Alteration

PRELIMINARY DESIGN AND DEVELOPMENT OF THE INTERMEDIATE WATER RECOVERY SYSTEM, (VOLUME I).
Garrett Airesearch Manufacturing Co., Los Angeles, Calif.
For primary bibliographic entry see Field 05D.
W72-00046

MECHANICS OF FLOW FROM STRATIFIED RESERVOIRS IN THE INTEREST OF WATER QUALITY: HYDRAULIC LABORATORY INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
Joseph P. Bohan, and John L. Grace, Jr.
Available from the National Technical Information Service as AD-723 976, $3.00 in paper copy, $0.95 in microfiche. WES Technical report no H-69-10, July 1969, 84 p, 23 refs.

Descriptors: *Water quality control, *Dams, *Hydraulic models, *Water supply, *Reservoir operation, Withdrawals, Boundry layers, Computer programs, Orifices.
Identifiers: Fluid flow, Input-output devices, Test methods, Test equipment.

Investigations were conducted to determine the characteristics of the withdrawal zone resulting from the release of flow through an orifice from a randomly stratified reservoir in experimental facilities for the purpose of developing means of predicting the quality of water discharged through similar openings in prototype intake structures. Distributions of density, generated by differentials in both temperature and dissolved salt concentration, and velocity were observed at various locations within a 1-ft-wide channel upstream of 0.08- and 0.16-ft-square orifices. These data were used to develop generalized expressions describing the limits of the zone of withdrawal and the distribution of velocities therein. In certain cases, the proximity of the free surface and/or bottom boundary may dictate the upper and/or lower limits of the zone of withdrawal. Means were developed (Appendix A) for evaluating the conditions under which these boundaries dictate the limits of the withdrawal zone and for determining the distribution of velocities within a zone of withdrawal restricted by boundary conditions. A sample problem (Appendix B) is presented to illustrate application of the results to determine the maximum discharge that may be released through a square orifice for a given set of conditions without exceeding the limits of a desired hypothetical zone of withdrawal. The example also illustrates how the actual limits of the zone of withdrawal and the velocity distribution therein are determined. A method is illustrated for predicting the dissolved oxygen content and/or other water quality parameters of the outflow provided the vertical distributions of these parameters in the reservoir are known. A FORTRAN IV program is presented in Appendix C
W72-00361

5G. Water Quality Control

HORIZONTAL HCL PICKLING LINE AT FUKUYAMA,
Nippon Kokan K. K., Fukuyama.
For primary bibliographic entry see Field 05D.
W72-00004

HALL-JONES OIL CO. V CORPORATION COMMISSION (DENIAL OF PERMIT TO DISPOSE OF SALINE WATER).
For primary bibliographic entry see Field 06E.
W72-00006

ANALYSIS OF FOOD PROCESSING WASTEWATERS,
Oregon State Univ., Corvallis. Dept. of Food Science and Technology.
For primary bibliographic entry see Field 05D.
W72-00011

ATTITUDES, ASSESSMENTS, AND ACTION,
Oregon State Univ., Corvallis.
George W. Gleeson.
Water Resources Research Institute, Seminar WR-014.71, July 1971, p 1-6.

Descriptors: *Pollution abatement, *Political aspects, *Social aspects, Environmental gradient, Population, Research and development, Technology, Water law, Air pollution, Water pollution, Oil wastes.

A realistic solution to the problem of degradation of the environment lies in long term analysis and planning. In order for long term planning to accurately predict the scope of the problems to be encountered, and to have a chance to remedy them, population stabilization must be achieved. Next, the necessary information for rational decisions must be gathered from each of the areas affected by the problem so that effective control measures can be instituted which will not aggravate either the particular problem in question or any other segment of the environment. Finally laws and regulations concerning application of science and technology to the problem must be consolidated and coordinated to avoid useless duplication and wasted effort. The technical know-how for solving nearly all environmental problems is close at hand, and could be quickly applied as soon as people become willing to pay for it and to maintain any advances which are made. (Lowry-Texas)
W72-00013

A NEW PROCESS FOR RECOVERY OF BY-PRODUCTS FROM SHELLFISH WASTE,
Food, Chemical, and Research Labs., Inc., Seattle, Wash.
For primary bibliographic entry see Field 05D.
W72-00025

REAERATION THROUGH LOW DAMS IN THE OHIO RIVER,
Cincinnati Univ., Ohio.
H. C. Preul, and A. G. Holler.
Proceedings, Industrial Waste Conference, 24th, May 6, 7, and 8, 1969, p 1249-1270. 7 fig, 10 tab.

Descriptors: *Water quqlity control, *Dissolved oxygen, *Reaeration, Aeration, Turbulence, Dams, Hydraulic models, Hydraulic design, Gate control, Laboratory tests, On-site tests, *Ohio River, Water pollution control.
Identifiers: Operational procedures.

With the requirement for maintaining the dissolved oxygen levels in our streams and rivers becoming more pressing, the requirement for information of the most efficient means of stream reaeration exists. Mechanical methods have been most popular and have been used in a number of cases. Aeration through design and operation of hydraulic structures has been largely over-looked. A study of the low dams in the Ohio River has been conducted to determine if different operational procedures would increase aeration. This study involved laboratory studies using a 1:92 scale model of the tainter gates used in these dams and field studies at the dam sites measuring DO above and below the dams for different operating conditions. It was found that opening fewer gates and increasing the opening of the gates operated, increased the amount of oxygen added to the water by a factor of up to two. For these particular gates and associated stilling basins, a submerged opening was more effective than having water flow over the top of the gate. The factors leading to these effects are discussed, providing the designer with a better understanding of the impact of hydraulic parameters on reaeration. This should allow new structures to incorporate designs which facilitate oxygen transfer as the water passes through low dams. (Goessling-Texas)
W72-00032

AN EXPERIMENTAL STUDY OF THE EFFECT OF CHANNEL SURFACE ROUGHNESS ON THE REAERATION RATE COEFFICIENT,
New Mexico State Univ., University Park.
W. P. Isaacs, and P. Chulavachana.
Proceedings, Industrial Waste Conference, 24th May 6, 7, and 8, 1969, p 1464-1476. 4 fig, 3 tab, 15 ref.

Descriptors: *Water quality control, *River systems, *Reaeration, *Dissolved oxygen, Roughness, Streamflow, Depth, Biochemical oxygen demand, Laboratory tests.
Identifiers: Streeter-Phelps equation.

The DO required for the stabilization of organic matter in a natural stream is available from sources within the stream, the waste at the point of discharge, the photosynthetic activity of green plants and reaeration. Numerous investigators have developed and refined equations for reaeration. One of the parameters in the Streeter-Phelps Oxygen Sag Equation is the reaeration coefficient 'k2' which is determined in part by the stream velocity which in turn is determined in part by the surface roughness of the channel. This study is dedicated to determining and evaluating the true nature of the effects of surface roughness on the reaeration rate constant. A laboratory device was constructed to simulate a flowing stream with variable velocities. DO was measured for differing stream velocities and conditions of surface roughness. The value of 'k2' was determined by least squares analysis performed on all the data for each experiment after the DO saturation value was determined. These experiments lead to the conclusion that the effects of reaeration due to channel surface roughness appear to be included through correlation with mean velocity or mean depth or both. It is possible to predict within a reasonable degree of accuracy the reaeration rate coefficient to be expected in channels of variable surface roughness from a knowledge of mean velocity and mean depth. (Goessling-Texas)
W72-00039

DIRECT DIGTAL CONTROL AT GRAND RAPIDS, MICHIGAN,
McNamee, Porter and Seeley, Ann Arbor, Mich.
For primary bibliographic entry see Field 05D.
W72-00043

A METHODOLOGY FOR DETERMINING OPTIMUM LONGITUDINAL SPACING OF EFFLUENT DISCHARGES INTO A RIVER,
Massachusetts Univ., Amherst. Water Resources Research Center.
For primary bibliographic entry see Field 05B.
W72-00047

EXPERIMENTAL HYDROLOGIC INVESTIGATIONS AT VALDAY (EKSPERIMENTAL'NYYE GIDROLOGICHESKIYE ISSLEDOVANIYA NA VALDAYE).
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02B.
W72-00061

DISPATCHING SYSTEM FOR CONTROL OF COMBINED SEWER LOSSES,
Minneapolis-Saint Paul Sanitary District, Minn.
Robert L. Callery.
Copy available from GPO Sup Doc as SN 5501-0103, $1.75; microfiche from NTIS as PB-203 678, $0.95. Environmental Protection Agency, Water Quality Office, Water Pollution Control Research Series Report, March 1971. 206 p, 81 fig, 30 tab,

36 ref. EPA/WQO Demonstration Grant 11020 FAQ 03/71.

Descriptors: *Storm runoff, *Sewers, *Overflow, *Pollution abatement, *Mathematical models, Diversion structures, Routing, Sewerage, Saintary engineering, Water management (Applied), Simulation analysis, Model studies, Water pollution control, Sampling, Analysis, Control, Monitoring.
Identifiers: *Combined sewers, *Regulator, Urban hydrology.

Results of initial operation of a computer-based data acquisition and control system for a major urban combined sewer system are presented. Impressive reductions in combined sewer overflow pollution of the Mississippi River in Minneapolis and St. Paul have been effected. Working entirely within the limits of the existing interceptor sewer system, and with relatively minor modifications to selected major combined sewer regulators, incidence of overflow was reduced by 66% and duration of overflow by 88% during most of a rainfall season. Computer simulation techniques using actual rainfall data indicate that the amount of overflow volume reduction achieved is the equivalent of a $200 million separation project. The reduction in volume of combined overflow to the river is estimated to be between 35% and 70% during the runoff season. The combined sewer system captured about 77% of the urban runoff at the modified locations. A mathematical model has been developed that will, with rain gage data as input, perform runoff analysis, diversion of combined sewer runoff hydrographs at regulators, and routing of diverted hydrographs through the interceptor system. Data from rain gages, regulator control devices, trunk sewers and interceptors, and river quality monitors provide real-time operating information. Time variant quality data from key locations in the sewer system have been acquired from analysis of numerous hourly samples.
W72-00080

THE EFFECTS OF VARIOUS ATMOSPHERES ON THE OXIDATION OF COAL MINE PYRITES,
NUS Corp., Pittsburgh, Pa. Cyrus Wm. Rice Div.
John D. Robins, and Joseph C. Troy.
Copy available from GPO Sup Doc as SN-5501-0111, $1.25; microfiche from NTIS as PB-203 679, $0.95. Environmental Protection Agency, Water Quality Office, Water Pollution Control Research Series Report, August 1971, 140 p, 29 fig, 49 tab, 8 ref. EPA-WQO Program 14010 ECC 08/71.

Descriptors: *Acid mine water, *Pyrite, Water pollution control, Water quality, Gases, Methane, Nitrogen, Carbon dioxide, Air, Mine wastes, Sulfides, Coal mine wastes, Iron bacteria, Oxidation.
Identifiers: *Oxygen free atmospheres, Mine drainage, Pyrite depletion.

Experiments up to 150 days in length were conducted to study the acid production rate of coal mine pyrites under various gas atmospheres. The gas atmospheres studied were air, nitrogen, methane, and carbon dioxide. The lower limits of the oxidation process were studied by introducing small amounts of oxygen along with the inert blanketing gas and by studying the effects of deaerated versus air saturated feedwater. Acid production was proportional to the available oxygen partial pressure. The acid parameters monitored continued to change and had not completely reached a steady state by the termination of the work. The acid production of nitrogen blanketed pyrite decreased to less than 1% of that of identical columns under air atmosphere. Nitrogen and methane gases were equally effective in reducing acid production. Both of these gases were slightly more effective than carbon dioxide. A large amount of detailed experimental data is presented.
W72-00081

COMBINED SEWER OVERFLOW ABATEMENT ALTERNATIVES: WASHINGTON, D.C.,
Weston (Roy F.), Inc., West Chester, Pa.
For primary bibliographic entry see Field 05D.
W72-00082

COMPUTER SIMULATION OF THE HYDROLOGIC-SALINITY FLOW SYSTEM WITHIN THE UPPER COLORADO RIVER BASIN,
Utah State Univ., Logan. Utah Water Research Lab.
For primary bibliographic entry see Field 07C.
W72-00084

GAS ABSORPTION IN A HETEROGENEOUS SYSTEM,
Iowa State Univ., of Science and Technology, Ames. Engineering Research Inst.
For primary bibliographic entry see Field 05A.
W72-00085

POLLUTION OF WATERS OF STATE.
For primary bibliographic entry see Field 06E.
W72-00095

DAMS AND ECOLOGY--CAN THEY BE MADE COMPATIBLE,
Civil Engineering Magazine, New York.
For primary bibliographic entry see Field 08A.
W72-00116

CLARIFICATION OF TURBID WATER BY FILTER FABRICS,
Corps of Engineers, Omaha, Nebr.
J. D. Rose, and H. L. Manges.
Paper No MC-71-202, presented at 1971 Mid-Central Meeting of the American Society of Agricultural Engineers, St. Joseph, Missouri, April 16-17, 1971. 8 fig, 1 tab, 3 ref. OWRR A-021-KAN (1).

Descriptors: *Filters, *Suspended load, *Particle size, *Turbidity, *Groundwater recharge, Laboratory tests, Methodology, Filtration, Flow rates, Surface waters, Sediment transport, Water quality control.
Identifiers: *Filter cloths, *Filter fabrics, *Turbidity removal.

Ssupended particles were removed from a laboratory-constituted slurry by filter fabrics through mechanical straining. Filtration was controlled by the filter cake with the fabric serving only as a septum upon which the cake formed. Flow rates through the filter were comparable to those through slow sand filters. The filter cloths used in the analysis were: one monofilament polypropylene cloth, two multifilament polypropylene cloths of different porosities, and one multifilament nylon cloth. The filter cloths had permeabilities of 5.1, 0.51, 0.42, and 0.53 all x 10 to the minus 9th power feet squared, respectively. The mechanical straining of the filter cloths is capable of turbidity removal, but nearly all of the suspended particles are removed by the cake. Some particles bleed through the filter cloth after once forming as cake. The filtration process can be described mathematically if the concentration of suspended-particles and the resistance to flow through the filter cake are known. The flow through the filter did not increase directly with increased pressure above the cake. The increased pressure caused the filter cake to compress, which increased the resistance to flow through the filter. (Woodard-USGS)
W72-00120

UNITED STATES V NORTHWEST PAPER CO. (STANDING TO BRING QUI TAM ACTION UNDER REFUSE ACT OF 1899).
For primary bibliographic entry see Field 06E.
W72-00121

A PROCEDURE FOR TRACING OF KRAFT MILL EFFLUENT FROM AN OCEAN OUTFALL BY CONSTITUENT FLUORESCENCE,
Pacific Northwest Water Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 05B.
W72-00123

STREAMFLOW ROUTING FOR WATER POLLUTION STUDIES,
Northeastern Univ., Boston, Mass.
R. J. Tucker, and A. S. Goodman.
Water Research, Vol 5, No 8, p 565-574, August 1971. 6 fig, 18 ref.

Descriptors: *Streamflow, *Water pollution, *Model studies, *Flow control, *Mathematical studies, Hydrologic data, Data collections, Computer programs, Hydrographs, Water quality, Waste dilution, Flow rates, Streams, Rainfall-runoff relationships, Peak discharge, Low flow, Water pollution control, Flow augmentation.

In developing a time variable mathematical model for water quality, a special flow routing procedure was designed to process moderate and low stream discharges. The procedure focuses on the discharge-velocity-time results necessary to study the effects of unsteady flow on stream pollution, in contrast with previously available routing methods which primarily estimate water surface elevations for floods. With input consisting of hydrograph data at an upstream station and discharge-velocity relationships for various reaches of the stream, an electronic digital computer processes a largely empirical program to determine hydrographs at any specified station. (Woodard-USGS)
W72-00124

INTERPRETATION OF RESULTS FROM THE STUDIES OF POLLUTION OF SURFACE FLOWING WATERS,
Water Economics Research Inst., Wroclaw (Poland). Water Protection Research Section.
For primary bibliographic entry see Field 05A.
W72-00125

ENQUIST V QUAKER OATS CO. (STANDING TO BRING QUI TAM ACTION UNDER REFUSE ACT OF 1899, AND TO SEEK INJUNCTION).
For primary bibliographic entry see Field 06E.
W72-00140

ZARROW V HUGHES (LIABILITY FOR OIL AND SALT WATER OVERFLOW FROM OIL WELL).
For primary bibliographic entry see Field 06E.
W72-00146

JACKSON V. CLARK (NECESSITY OF CAUSAL RELATIONSHIP BETWEEN POLLUTION DAMAGE AND THE CONDUCT OF A DEFENDANT).
For primary bibliographic entry see Field 06E.
W72-00159

MAGNOLIA PIPELINE CO V. STATE (ACTIONS OF A THIRD PARTY AS DEFENSE TO POLLUTION PROSECUTION).
For primary bibliographic entry see Field 06E.
W72-00160

CITY OF BETHANY V. MUNICIPAL SECURITIES CO. (APPEALING PARTY LIMITED TO DEFENSES RAISED AT TRIAL).
For primary bibliographic entry see Field 06E.
W72-00167

PUBLIC PERCEPTION OF ENVIRONMENTAL QUALITY IN TUCSON, ARIZONA,
Arizona Univ., Tucson. Dept. of Geography; and University Coll., London (England).
T. F. Saarinen, and R. U. Cooke.
Journal of the Arizona Academy of Sciences, Vol 6, No 2, p 260-274, June 1971. 2 fig, 14 tab, 11 ref.

Descriptors: *Arid lands, *Arizona, *Pollutants, *Social values, *Behavioral aspects, Pollution

identification, Aircraft, Rural sociology, Urban sociology, Social impact, Social participation, Natural resources, Public rights, Air environment, Air pollution, Water table, Arroyos, Soil erosion, Decision making, *Attitudes.
Identifiers: *Littering.

While studies have been made of public perception of air and water pollution, no research attempts have been made to survey the public perception of the entire gamut of environmental problems in one area. This type of study should provide information to facilitate decision-making processes by policy makers. The results from this study in Tucson should contribute to the general body of information concerning man in arid environments. Residents of Tucson and surrounding rural areas were subjected to interviews from questionnaires (a sample of which is included) concerning their perception of various environmental problems and their socioeconomic status. The results revealed a favorable image dominated by a fine climate, and the advantages of the area far outweighed the disadvantages. No single problem emerged as being of overriding importance; rather Tucsonans appeared to be concerned by a range of relatively small problems. Of the various land, water, air and social problems considered, air pollution, noise pollution and littering were considered the worst. Several problems were only perceived as being serious in the localities where they are pronounced, leading to conclusion that most people perceive problems only when they are directly affected by them. Variations in the perception of problems according to socioeconomic class, neighborhood rating and age were apparent, but conclusions were difficult because of small sample sizes. In the cases of the major problems, the public felt they were worsening and tended to be pessimistic about authorities committment to their solution. Surprisingly, for an arid area, water problems did not generally rank high. (Casey-Arizona)
W72-00174

RESOLUTION ESTABLISHING AMENDED CRITERIA OF STREAM WATER QUALITY FOR VARIOUS USES ADOPTED BY THE BOARD ON APRIL 14, 1970.

Water Pollution Control Board, Ohio Department of Health, Columbus, Ohio, April 1970. 5 p, 1 tab.

Descriptors: *Ohio, *Standards, *Water pollution control, *Water utilization, Regulation, Administration, Administrative agencies, State governments, State jurisdiction, Water pollution, Water pollution sources, Legal aspects, Water quality, Water quality control, Pollution abatement, Industrial use (Water), Water supply, Public health, Recreation.

This regulation establishes general minimum conditions applicable to all waters at all places and at all times for eleven watercourses specifically covered. Waters whose existing quality is better than the established standards as of the date on which such standards become effective must be maintained at their existing high quality so as not to interfere with or become injurious to any assigned uses made of, or presently possible in such waters. The regulation prescribes various quality standards for each of the following water uses: (1) public water supply, (2) industrial water supply, (3) aquatic life, (4) recreation, and (5) agricultural usage and livestock watering. Specific standards put forth deal with the following criteria: (1) bacteria, (2) threshold-odor number, (3) dissolved solids, (4) radioactivity, (5) chemical constituents, (6) pH factors, (7) water temperature, (8) dissolved oxygen, and (9) toxic substances. (Horwitz-Florida)
W72-00188

PERMITS FOR NEW OUTLETS AND DISPOSAL SYSTEMS.

New York Public Health Law, secs. 1230 thru 1233 (McKinney 1971).

Descriptors: *New York, *Permits, *Treatment facilities, *Waste disposal, Legislation, State governments, State jurisdiction, Project planning, Administrative agencies, Water pollution, Water pollution control, Water pollution sources, Legal aspects, Public health, Public rights, Sewage treatment, Sewage disposal, Industrial wastes, Waste treatment, Water quality control, Taxes.

A permit issued by the Commissioner of Public Health is required before any person may: (1) make or use any new outlet for the discharge of sewage, industrial waste, or other wastes, or the effluent therefrom into waters of the state; (2) construct or operate a new disposal system for the discharge of sewage or other waste; (3) make any change in, addition to, or extension of existing disposal systems which would materially alter the volume, or method of treating or disposing of sewage or other waste; and (4) increase or alter the content of wastes by a change in volume or physical, chemical, or biological characteristics. Before any permit is issued, the Commissioner must be provided with and approve complete project plans. An exception to the permit requirement is provided for certain private dwellings meeting enumerated requirements. The issuance, denial, and revocation of permits must be accomplished at a public hearing. Provisions are established for the granting of certificates of compliance to completed and uncompleted projects for purposes of real property tax law. (Horwitz-Florida)
W72-00189

STREAM PRESERVATION IN ARKANSAS.

For primary bibliographic entry see Field 02E.
W72-00190

CONTRACT REGARDING AN INTERIM SUPPLEMENT TO TANKER LIABILITY FOR OIL POLLUTION.

International Legal Materials, Vol 10, No 1, p 137-144, January 1971. 8 p.

Descriptors: *International law, *Oil industry, *Contracts, *Water pollution, International commissions, Legal aspects, Law of the sea, International waters, Oil wastes, Projects, Damages, Remedies, Water pollution control, Water pollution sources, Water pollution effects, Fuels, Public rights, Project planning, Ships.

Several major oil companies entered into this contract to establish a fund for the payment of certain damages caused by oil pollution from ocean tankers. The parties to the contract endorsed the International Convention on Civil Liability for Oil Pollution Damage adopted at Brussels on November 29, 1969. Realizing, however, that in some instances persons sustaining oil pollution damages may be unable, even after ratification of the Convention, to recover adequate compensation for such damages, the companies agreed to establish this fund, which provides supplemental compensation for pollution damage beyond the limits of liability available under existing legal regimes, including the Tanker Owners Voluntary Agreement Concerning Liability for Oil Pollution, and beyond the limits of liability that will be applicable under the Convention on Civil Liability. The contract specifies procedures for establishing the fund, as well as rules concerning membership and the duration of the agreement. Procedures and regulations concerning third party recovery from the fund are also specifically put forth. (Horwitz-Florida)
W72-00191

AMENITIES RIGHTS--PARALLELS TO POLLUTION TAXES,

Naval War College, Newport, R. I.
L. F. E. Goldie.
Natural Resources Journal, Vol 11, No 2, p 274-280, April 1971. 7 p, 17 ref.

Descriptors: *Pollution abatement, *Public rights, *Judicial decisions, *Taxes, Legal aspects, Political aspects, International law, State governments, State jurisdiction, Federal government, Water pollution, Legislation, Permits, Project planning, Third party effects, Industrial wastes, Water pollution control, Environment, Environmental effects.

This article considers pollution taxes and amenities rights as possible solutions to the problems of environmental pollution. Special attention is given to Michigan's recently enacted Thomas S. Anderson, Gordon Rockwell Environmental Protection Act. This Act is considered to be an excellent method of providing the individual with the power to take legal action against polluters. The advantages of individual amenities rights in fighting pollution are considered to be threefold. First, decentralization would be accomplished since the enforcement of the obligation not to pollute the environment would be performed by individuals who are most directly harmed. Secondly, pollution costs would become part of the costs of production through insurance expenses incurred to protect the firm from individual lawsuit liability. Finally, the growth of international operations can be achieved if judgments against polluters are given transnational recognition by treaty or extension of the rules concerning conflicts of law. The role which the government must play in the creation of such amenities rights is considered, along with the prevention of possible abuses by individuals. The article concludes with a consideration of the effect of amenities rights on the international scene. (Horwitz-Florida)
W72-00192

RULES AND REGULATIONS--WATER QUALITY STANDARDS.

Iowa Water Pollution Control Commission, Des Moines.

1971. 5 p.

Descriptors: *Iowa, *Water quality control, *Standards, *Water pollution control, *Administrative decisions, Regulation, Water quality, Water pollution, Water pollution sources, Legal aspects, Pollutants, Surface waters, Water resources, Water policy, Administration, Administrative agencies, Water supply, Recreation, Aquatic life, Water utilization, Adoption of practices, Municipal wastes, Interstate.

The Iowa Water Pollution Control Commission shall designate the quality of surface waters, based on their ability to support the legitimate uses to which such waters can feasibly be adapted. Surface waters must be free at all times and places from the following: (1) municipal, industrial, or other discharges that will settle and form objectionable sludge deposits; (2) floating debris, oil, scum, and other floating materials in amounts sufficient to be unsightly or deleterious; (3) color, odor, or other conditions in such degree as to be detrimental to legitimate uses of water; and (4) discharges harmful to human, animal, industrial, agricultural, recreational, aquatic, or other legitimate water uses. Specific criteria are provided for such designated water uses as public water supplies, aquatic life needs, and recreational activities. Continuous disinfection shall be provided for municipal waste effluents and certain other wastes. With certain exceptions, waters whose quality is better than established standards will be maintained at high quality. Treatment requirements are set forth for certain designated interstate waters. (Horwitz-Florida)
W72-00194

WATER QUALITY STANDARDS (INTERSTATE WATERS, ILLINOIS RIVER AND LOWER SECTION OF DES PLAINES RIVER),

Illinois Sanitary Water Board, Springfield.
For primary bibliographic entry see Field 06E.
W72-00195

WATER QUALITY STANDARDS (INTERSTATE WATERS, LAKE MICHIGAN AND LITTLE CALUMET RIVER, GRAND CALUMET RIVER AND WOLF LAKE).
Illinois Sanitary Water Board, Springfield.

Rules and Regulations SWB-7, March 1968. 22 p, 1 map, 2 tab.

Descriptors: *Illinois, *Lake Michigan, *Standards, *Water pollution control, Rivers, Regulation, Pollution abatement, Administrative agencies, Permits, State governments, State jurisdiction, Water pollution, Water quality, Water quality control, Public health, Water pollution sources, Legal aspects, Waste disposal, Treatment facilities, Water utilization.

Lake Michigan is used for industrial and public water supplies, commercial and sport fishing, and recreational activities. To insure optimum protection of each use, the lake is divided into two sectors: open water and shore water. Separate standards are provided for each sector. Standards are also established for the Little Calumet River, Wolf Lake, and the Grand Calumet River. Detailed water quality criteria are established in reference to: coliform bacteria, fecal streptococci, turbidity, odor, oil, floating solids and debris, bottom deposits, true color, threshold odor, temperature, pH, dissolved oxygen, ammonia nitrogen, total nitrogen, chlorides, cyanides, fluorides, dissolved iron, phenol-like substances, sulfates, total phosphates, and miscellaneous contaminants and radionuclides. Implementation and enforcement plans are set forth. The responsibility of controlling and preventing water pollution is placed upon the Sanitary Water Board. In the Chicago area, responsibility is vested in the Metropolitan Sanitary District. The goal of this promulgation is to protect and upgrade water quality. To achieve this goal, any wastes amenable to control must receive the best practicable treatment prior to discharge. Furthermore, waters having higher standards than those herein adopted may not be degraded. (Horwitz-Florida)
W72-00196

INTERSTATE AND INTRASTATE WATER TEMPERATURE STANDARDS FOR PROTECTION OF FISH AND AQUATIC LIFE.
Michigan Water Resources Commission, Lansing. Dept. of Natural Resources.

August, 1971. 6 p, 1 tab.

Descriptors: *Michigan, *Water temperature, *Thermal pollution, *Standards, Mixing, Regulation, Administration, Administrative agencies, Legal aspects, Water law, Measurement, Water pollution, Water pollution control, Waste dilution, Thermocline, Hypoliminion, Anadramous fish, Salmonids, Fish migration, Intakes, Adoption of practices, Administrative decisions, Thermal water.

The application of water temperature standards herein set forth requires a knowledge of specific definitions and general considerations. In all receiving waters the points of measurement shall normally be in the surface one meter at such depth to avoid thin layer surface warming due to extreme ambient air temperatures. Thermal discharges will be allowed to exceed standards when natural water temperatures are higher than the standard due to the method of selecting the monthly standard. No heat load shall be discharged so as to be injurious to fish, wildlife, or other aquatic life. Regardless of the standards established, modifications must be made if environmental damage is measureable. Mixing zones for thermal discharges will be established on a case by case basis and will be designed to minimize effects on the aquatic biota and to permit fish migration. Water intakes shall be designed and located to minimize entrainment and damage to desirable aquatic organisms. Specific standards are herein promulgated for the Great Lakes and specified connecting waters, inland lakes, and rivers and streams. Standard temperatures are intended for the edge of the mixing zone. (Johnson-Florida)
W72-00198

SUMMARY OF WATER QUALITY STANDARDS FOR DESIGNATED USE AREAS IN MICHIGAN INTERSTATE WATERS.
Michigan Water Resources Commission, Lansing. Dept. of Natural Resources.

November, 1968. 29 p, 10 map, 1 tab.

Descriptors: *Michigan, *Standards, *Water quality control, *Water utilization, Environmental engineering, Dredging, Waste disposal, Regulation, Administrative agencies, Legal aspects, Lake Michigan, Lake Huron, Lake Erie, Lake Superior, Water pollution, Water pollution control, Interstate, Channel improvement, Effluents, Water pollution sources, River basins, Interstate rivers.

Interstate standards, water use designations, and implementation plans of the Michigan Water Resources Commission are herein summarized. Designated use areas considered by this publication include: (1) the St. Joseph River basin; (2) Lake Michigan; (3) Lake Huron; (4) the St. Clair River-Lake St. Clair, Detroit River-Lake Erie, Maumee River basin; (5) Lake Superior and the St. Marys River; and (6) the Menominee and Montreal River basins in Michigan and other Michigan-Wisconsin interstate boundary waters. Standards will not apply during periods of authorized dredging for navigation purposes, but will apply to areas affected by the disposal of spoil from such operations. When waters are classified under more than one designated water use, it is intended that the most restrictive individual standrads of the designated use shall be adhered to. In areas adjacent to outfalls standards apply only after admixture of waste effluents with the public waters, but in no instance shall the mixing zone act as a barrier to fish migration or interfere unreasonably with the designated uses of the area. A summary of the legislative bases of Michigan's program to control and abate pollution is set forth. (Johnson-Florida)
W72-00199

HOW YOUR MICHIGAN WATER RESOURCES COMMISSION PROTECTS MICHIGAN'S LAKES AND STREAMS.
Michigan Water Resources Commission, Lansing. Dept. of Natural Resources.
For primary bibliographic entry see Field 06E.
W72-00200

MICHIGAN'S INTRASTATE WATER QUALITY STANDARDS--INTRASTATE USE DESIGNATION AREAS.
Michigan Water Resources Commission, Lansing. Dept. of Natural Resources.

March 1969. 41 p, 6 map, 1 tab, 3 append.

Descriptors: *Michigan, *Water quality control, *Standards, *Water utilization, State governments, Legal aspects, Water law, Legislation, Administrative agencies, Regulation, Water quality, Radioactivity, Temperature, Nutrients, Coliforms, Dissolved oxygen, Dissolved solids, Hydrogen ion concentration, Toxicity, Water supply, Recreation, Aquatic life, Water resources development, Pollutants, Water pollution control.

The Michigan Water Resources Commission has adopted water quality standards for both its interstate and intrastate waters. These standards incorporate two important principal objectives. First, waters in which the existing quality is better than the established standards will not be lowered in quality except where no injury will result. Second, water which does not meet the standards will be improved in quality to meet the standards. After stating the authority and the developmental guidelines used for the intrastate standards, this publication defines the possible water uses. The uses include: (1) domestic water supply; (2) industry; (3) recreation; (4) fish, wildlife and other aquatic life; (5) agriculture; and (6) commercial and other uses. The standards for these uses are charted using eleven separate parameters. Water use designations are listed for specific bodies of water with an accompanying map for each use. The scope of application of the designated use areas and their standard parameters are specified for certain instances where problems might arise. The appendix includes a glossary, bibliography, and the Act establishing the Water Resources Commission. (Johnson-Florida)
W72-00201

AIR AND WATER POLLUTION CONTROL--PERMITS.
For primary bibliographic entry see Field 06E.
W72-00202

ENVIRONMENTAL PROTECTION ACT.
For primary bibliographic entry see Field 06E.
W72-00204

INTERSTATE ENVIRONMENTAL COMPACT.
For primary bibliographic entry see Field 06E.
W72-00205

UNITED KINGDOM: OIL IN NAVIGABLE WATERS ACT OF 1971.
For primary bibliographic entry see Field 06E.
W72-00213

PICKENS V. HARRISON (DAMAGES TO IRRIGATION WELL CAUSED BY SALT WATER POLLUTION FROM OIL WELL).
For primary bibliographic entry see Field 06E.
W72-00214

WATERS--TIDAL WATERS--POWER OF LEGISLATURE TO AUTHORIZE POLLUTION OF FISHERIES.
Harvard Law Review, Vol 46, p 165-166, 1933. 2 p.

Descriptors: *Virginia, *Public rights, *Fishing, *Navigable waters, *Ownership of beds, Water rights, Judicial decisions, State governments, Legislation, Water pollution control, Water law, Water resources development, Legal aspects, Project planning, Sewage disposal, Sewers, Environmental sanitation, Water pollution sources, Oysters, Environmental effects, Beds, Beds under water, Relative rights, Tidal waters.
Identifiers: *Public trust doctrine.

The impact of a specific case in relation to the public trust doctrine is examined in this case comment. An act of the state legislature had authorized a city to either erect a disposal plant or construct a new system emptying directly into tidal waters. The latter alternative would render the tidal waters unfit for fishing or the cultivation of oysters. Commonwealth ex rel. Attorney General v. Newport News, 164 S.E. 689 (Va. 1932), involved a bill brought to restrain the city from adopting the latter alternative. The bill was based on the public trust doctrine which holds that tidal waters and the land under them are held by the state in trust for the people for the exercise of the public rights of navigation and fishing, and that the legislature lacks the power to substantially impair these rights. The Virginia Supreme Court held that the legislature had the power to render tidal waters unfit for fishing. The comment notes that American courts adopted the public trust doctrine from the English but failed to recognize that states succeeded not only to the title of the Crown, but also to the sovereignty of Parliament. The usual principle is that the legislative power is absolute, save when expressly curbed by the constitution. Except on grounds of policy, it is difficult to see why tidal waters, like public lands, are not the state's to do with as it sees fit. (Johnson-Florida)
W72-00215

POLLUTION OF WATERS.
Florida Dept. of Air and Water Pollution Control, Tallahassee.
For primary bibliographic entry see Field 06E.
W72-00216

OIL SPILL.
For primary bibliographic entry see Field 06E.
W72-00217

SECTION 169: AMORTIZATION OF POLLUTION CONTROL FACILITIES.

Internal Revenue Code of 1954, section 169.

Descriptors: *Taxes, *Tax rate, *Water pollution control, *Treatment facilities, *Federal government, Government finance, Non-structural alternatives, Administration, Administrative agencies, Regulation, Water pollution, Water quality, Water quality control, Pollution abatement, Environmental sanitation, Waste treatment, Water treatment.

Every person, at his election, shall be entitled to an amortization deduction for certified pollution control facilities. The amortizable basis may be amortized over a 60-month period. The amortizable basis shall bear the same ratio to that portion of the adjusted basis of such facility as 15 bears to the number of years of useful life if the useful life is in excess of 15 years. Necessary definitions are set forth. The amortization basis deduction may be discontinued at any time, and the depreciation deduction of section 167 shall be allowed. No pollution control facility shall be certified if its costs, by reason of profits, will be recovered over its useful life. The amortizable basis shall not be increased or decreased for improvements or additions after the amortization period has begun. A section 167 depreciation deduction shall be allowed for that portion of the adjusted basis which is not the amortizable basis. Life tenants shall be treated as absolute owners. (Robinson-Florida)
W72-00218

RULES AND REGULATIONS ESTABLISHING SURFACE WATER QUALITY CRITERIA.
New Jersey Department of Environmental Protection, Trenton, New Jersey, June, 1971. 19 p.

Descriptors: *New Jersey, *Water quality control, *Standards, *Pollution abatement, Water quality, Water pollution, Water pollution control, Industrial wastes, Domestic wastes, Administrative agencies, Water resources, Surface waters, Waste treatment, Waste water treatment, Legal aspects, Regulation, Air pollution effects, Odor, Water properties, Dissolved oxygen, Water temperature, Hydrogen ion concentration, Solid wastes, Radioactivity, Bacteria.

New Jersey's surface water quality criteria are definitions of acceptable water quality for the various categories of surface waters in the state. They are not intended to be enforcement standards in their own right, but represent water quality objectives hopefully to be met through a rigorous enforcement program. The entry of wastes into a stream cannot be permitted if it will cause the quality of the stream to fail to meet the criteria. For waterways that are polluted all waste treatment effluents and other pollutants must be upgraded or eliminated to permit the restoration of quality as defined by the criteria. In all such cases standards are imposed upon the effluent in the form of existing treatment regulations, administrative orders, or where necessary, orders of the court. The criteria consist of: (1) a statement of policy on the protection and enhancement of water resources, (2) a glossary of terms, and (3) parameters of quality consisting of numerical values and narrative descriptions for defined water uses, dealing with taste and odor producing substances, pH, dissolved oxygen, temperature, radioactivity, bacterial outlay, toxic and deleterious substances and floating and settleable solids. (Gallagher-Florida)
W72-00219

POSSIBLE LIABILITIES ARISING FROM VIOLATIONS OF CONSERVATION ORDERS,
Cooke, Moulton, Bellingham and Longo, Billings, Mont.
For primary bibliographic entry see Field 06E.
W72-00220

THE WATER POLLUTION CONTROL AGENCY: LEGAS BASIS, ADMINISTRATION REGULATIONS AND STAFFING,
Illinois State Dept. of Health, Springfield.
C. W. Klassen.
Aspects of Water Pollution Control, p. 9-19 (World Health Organization, Public Health Papers No. 13, 1961). 11 p.

Descriptors: *Water pollution control, *Political aspects, *Administration, *Public health, Water pollution, Legal aspects, Water pollution sources, Water pollution effects, Water conservation, Jurisdiction, Administration, Administrative agencies, Waste disposal, Water quality, Water quality control, Project planning, Permits, Standards, Treatment facilities.

Regardless of geographic location, the causes and problems of water pollution are basically the same throughout the world. This article puts forth a framework for water pollution control that may be employed by any nation. The author is primarily concerned with the actions necessary to protect the quality of waters yet unused and to make reusable waters that are already being used. Purely voluntary pollution control action has not been found effective; prevention or abatement beyond what can be secured by persuasion must be obtained by legal pressures and court action. The essential elements that must be included in any pollution control law are considered in detail. These include: (1) statement of policy, (2) definitions, (3) creation and authority of a water pollution control agency, (4) jurisdiction and enforcement, (5) penalties, (6) administration of the law, and (7) staffing. The most important aspect of any new law is the water pollution control agency, which must be separate from pre-existing government departments and must be composed of all interests involved in the utilization of waters. (Horwitz-Florida)
W72-00221

WATER POLLUTION CONTROL IN THE USSR AND EASTERN EUROPEAN COUNTRIES,
State Public Health Inspectorate (USSR).
T. Nagibina.
Aspects of Water Pollution Control, p. 21-38 (World Health Organization, Public Health Papers No. 13, 1961). 18 p, 1 ref.

Descriptors: *Water pollution control, *Foreign countries, *Water resources development, *Governments, Water pollution, Water pollution treatment, Water pollution sources, Water pollution effects, Water quality, Water quality control, Treatment facilities, Pollutants, Pollution abatement, Water resources, Administrative agencies, Administration, Administrative decisions, Financing, Government finance.

Protection of waters in the U.S.S.R., Czechoslovakia, Poland, Bulgaria, Hungary, and Romania is regarded as an integral part of the water resources utilization problem. Hence water pollution control is a pressing water-economy problem which is being attacked by a system of State measures. The features of this system common to all of the listed countries are: (1) State legislation establishing principles and directives for utilization and protection of water resources, and creating executive and inspection agencies with necessary authority; (2) regulation of waste water discharge, based upon water quality standards of the receiving waters; (3) state planning for waste treatment facilities, and allocation of funds for their construction; (4) coordination of water protection research and planning; and (5) coordination between East Germany, Czechoslovakia, Poland, and the U.S.S.R. for research into phenolic water pollution. Some duplication of work occurs in these countries. Scientific and technical conferences have been held, however, to exchange information. Establishment of an international center in Europe for the study of water problems and information is recommended. (Hart-Florida)
W72-00222

WATER POLLUTION IN INTERNATIONAL LAW,
Advisory Commission on Water Pollution Control, Helsinki (Finland).
E. J. Manner.
Aspects of Water Pollution Control, p. 53-73 (World Health Organization, Public Health Papers No. 13, 1961). 21 p, 62 ref.

Descriptors: *International law, *Water pollution control, *Foreign countries, *Water pollution effects, Water pollution, Water pollution sources, Water quality, Water quality control, Pollutants, Pollution abatement, International waters, Governments, Treaties, International commissions, Internal water, Bodies of water, Law of the sea, Foreign waters, Commercial fishing, Legal aspects, Judicial decisions.

No multilateral international convention exists at present which prescribes the rights and duties of nations concerning water pollution in inland waters. In fact, no definition of water pollution exists upon which an international legal practice would be based. Very few treaties consider water pollution, and no international tribunal has considered the problem; nevertheless, the meager evidence suggests that extending the consequences of pollution into another nation violates customary international law. Furthermore, legal writers and international bodies conclude that preventable pollution which causes substantial injury to another nation violates international law. Additionally, the general principles of the territorial rights of nations expressed in the literature on inter-State relations emphasizes a national obligation to heed territorial interests of other nations, but considers the obligation broken only by a material violation of territorial integrity. Thus the international consensus is that a nation must refrain from causing material injury to its neighboring nation by pollution of inland waters. Although treaty provisions exist concerning pollution of the high seas, no specific rules cover pollution of inland seas; nevertheless, pollution of another nations's inland sea areas must be regarded as a prohibited interference. (Hart-Florida)
W72-00223

LIABILITY IN NATIONAL AND INTERNATIONAL LAW FOR DAMAGE THROUGH WATER POLLUTION,
Frankfurt Univ. (West Germany).
H. Fischerhof.
Aspects of Water Pollution Control p. 75-85 (World Health Organization, Public Health Papers No. 13, 1961). 11 p, 27 ref.

Descriptors: *Foreign countries, *International law, *Remedies, *Damages, Water pollution, Water pollution control, Foreign waters, International waters, United Nations, Governments, Legislation, Legal aspects, Water quality control.

This article discusses liability in national and international law for damages resulting from water pollution. Protection from pollution constitutes a problem for international as well as national law. The prophylactic effect of civil-law liability and its tendency to prevent recurrence of offenses rather than payment of compensation for damages renders it a more effective instrument of protection than the threat of penalties under criminal law. The law of liability has developed along two lines. While liability through culpability is well established, liability through jeopardy, consequential liability, causal liability, or absolute liability is developing. Here, the responsible party is liable without proof of culpability. In Europe the tendency is to tighten up the provisions concerning liability for damage through stringent national laws. Since international

private law may be ineffectual in eliminating damage in one country resulting from water pollution in another, the introduction of the concept of liability or assimilation of nationalliability laws by either the collation of laws or the conclusion of an international convention may be the solution. Additionally, the article discusses liability for water pollution damage in public international law. Consideration is given to neighbors' rights, the principle of continuity, and bilateral and multilateral agreements. (Shelnut-Florida)
W72-00224

REGULATION ESTABLISHING WATER QUALITY CRITERIA FOR INTERSTATE AND INTRASTATE STREAMS.
Regulation No. 2, Arkansas Pollution Control Commission, May 1967, as amended, March, 1971. 9 p.

Descriptors: *Arkansas, *Water pollution control, *Standards, *Water quality, State governments, State jurisdiction, Regulation, Administration, Administrative agencies, Water pollution, Legal aspects, Permits, Inspection, Waste treatment, Waste disposal, Wastes, Water conservation, Public health, Water quality control, Supervisory control (Power).

This regulation originally pertained only to interstate waters, but was extended to intrastate waters in March of 1971. The adopted standards are designed to enhance the quality, value, and beneficial uses of the water resources of the state, and to aid in the prevention, control, and abatement of water pollution. The purpose of the regulation is to preserve and enhance the quality of state waters so that such waters shall be reasonably available for all beneficial uses and thus promote the social welfare and economic well being of the public. The discharge of waste is prohibited without first obtaining a permit showing that applicable water quality standards will be met. The regulation prescribes general water quality criteria that include: (1) methods of quality testing, (2) locations for sampling, and (3) the effect of stream flow on standards. Specific criteria are established covering the following factors: (1) temperature, (2) color, (3) turbidity, (4) taste and odor, (5) floating material, (6) oil and grease, (7) pH, (8) dissolved oxygen, (9) radioactivity, (10) bacteria, (11) toxic substances, and (12) mineral quality. (Horwitz-Florida)
W72-00225

GENERAL WATER QUALITY CRITERIA FOR THE DEFINITION AND CONTROL OF POLLUTION IN THE WATERS OF TENNESSEE.
Tennessee Stream Pollution Control Board, Nashville.

March 1971. 8 p.

Descriptors: *Tennessee, *Standards, *Water pollution control, *Water utilization, State governments, State jurisdiction, Administration, Administrative agencies, Legal aspects, Regulation, Project planning, Public health, Water pollution, Pollution abatement, Water quality, Water quality control, Water pollution sources, Water allocation (Policy), Sewage, Waste treatment.

This regulation is adopted as a guide in determining the permissible conditions of waters with respect to pollution and the preventive or corrective measures required to control pollution in various waters. Standards are adopted for each of the following water uses: (1) domestic raw water supply, (2) industrial water supply, (3) fish and aquatic life, (4) recreation, (5) irrigation, (6) livestock watering and wildlife, and (7) navigation. Criteria used in setting standards for each of the recognized water uses include: dissolved oxygen, pH value, mineral compounds, dissolved solids, floating materials, turbidity, temperature, microbiological coliform, taste, odor, and toxic substances. The standards are designed to provide for the protection and upgrading of existing water quality. It is recognized that some waters may have existing quality that is better than established standards; standards shall not be construed as permitting the degradation of such waters when such action can be prevented by reasonable pollution control measures. Furthermore, all discharges of sewage, industrial, or other waste shall receive the best practicable treatment according to the policy of the pollution control board. (Horwitz-Florida)
W72-00226

RURAL WATER AND SANITATION FACILITIES.
For primary bibliographic entry see Field 06E.
W72-00227

INTER-GOVERNMENTAL MARITIME CONSULTATIVE ORGANIZATION: DRAFT CONVENTION ON CIVIL LIABILITY FOR POLLUTION DAMAGE.
For primary bibliographic entry see Field 06E.
W72-00228

INTER-GOVERNMENTAL MARITIME CONSULTATIVE ORGANIZATION: DRAFT CONVENTION ON RIGHTS OF COASTAL STATES TO INTERVENE IN CASUALTIES ON THE HIGH SEAS CAUSING OIL POLLUTION.
For primary bibliographic entry see Field 06E.
W72-00229

INTERNATIONAL CONVENTION FOR THE PREVENTION OF POLLUTION OF THE SEA BY OIL, 1954 (AS AMENDED).
For primary bibliographic entry see Field 06E.
W72-00230

AGRICULTURAL AND RELATED WASTES CONTROL.
Regulations No. 28-18-1 thru 28-18-4, Kansas Department of Health, Environmental Health Services, Topeka, Kansas, May, 1967. 4 p.

Descriptors: *Waste disposal, *Kansas, *Domestic animals, *Water pollution control, Water pollution, State governments, State jurisdiction, Administration, Regulation, Administrative agencies, Legal aspects, Permits, Standards, Water pollution sources, Treatment facilities, Public health, Cattle, Sheep, Farm wastes, Farms.

The operator of any newly proposed or existing confined feeding operation must register with the department of health. All application forms shall contain information regarding general features of topography, drainage course, and identification of ultimate primary receiving streams. If a confined feeding operation constitutes a water pollution hazard the operator must provide water pollution control facilities which shall be constructed in accordance with plans and specifications approved by the department. Such water pollution control facilities shall not be placed in use until a permit has been issued by the board of health. If a water pollution control facility's permit is revoked, the owner or operator of the confined feeding operation involved shall be allowed to finish feeding existing animals, but may not place any more animals in the feeding area until the minimal requirements are met. The regulation establishes the minimum requirements for water pollution control facilities used for the confined feeding of cattle, swine, sheep, and other animals. All such facilities must be operated and maintained so as to prevent water pollution and protect the public health and the beneficial uses of the state's waters. (Horwitz-Florida)
W72-00231

ECOLOGICAL DETERMINANTS IN POLLUTION CONTROL SYSTEMS,
Bernard Coll., New York.
D. W. Ehrenfeld.
In: Proceedings of the Conference on International and Interstate Regulation of Water Pollution, March 12-13, 1970, Columbia University School of Law, New York, New York, p. 3-10, 8 p.

Descriptors: *Water quality control, *Standards, *Aquatic environment, *Chemical analysis, *Water pollution effects, Animal behavior, Biology, Balance of nature, Biodegradation, Biological communities, Environmental effects, Plant groupings, Animal groupings, Water pollution, Water pollution control, Efficiencies, Legal aspects, Eutrophication.

Biologists are just beginning to learn how to provide ecological guidelines for lawyers and others working in the area of environmental pollution. For example, even in the crucial area of the definition and determination of pollution, biologists have until recently left unchallenged the idea that chemical tests and measurements can define the extent of pollution in any specific situation. Biologists now know that the state of the aquatic community of plants and animals is by far the most sensitive indicator of water pollution. The author defines water pollution biologically as an unusual deterioration of the biological community in a body of water as a result of something done to the water by man. To illustrate this definition, the author explains in detail the process of eutrophication and the ineffectiveness of standard chemical tests in defining pollution. The author suggests that pollution be judged according to its biological effects. In addition, he outlines other general biological aspects of water pollution that environmental lawyers ought to know about. (Gallagher-Florida)
W72-00232

INABILITY OF TRADITIONAL FORMS OF POLITICAL ORDER TO ADAPT TO MODERN PROBLEMS OF INTERNATIONAL POLLUTION,
R. A. Falk.
In: Proceedings of the Conference on International and Interstate Regulation of Water Pollution, March 12-13, 1970, Columbia University School of law, New York, New York, p. 11-17. 7 p.

Descriptors: *Oceans, *International law, *Water pollution control, *Regulation, Water pollution, Water pollution sources, Water quality, Water quality control, Growth rates, Environmental effects, Water utilization, Non-consumptive use, Water resources development, Natural resources, Exploitation, Treaties, Organizations.

After noting several causes for concern about the actual potential of the present popularity of environmental degradation as a cause celebre, the author discusses the modern setting for international pollution problems. The critical indicators bearing on the use of the oceans are discouraging from the point of view of pollution control. Present trends of behavior all point toward rapid rates of dangerous growth--increasing use, increasing volume, increasing scale--which produce ever greater pressures on ocean quality. In discussing the traditional international framework of use and control, the author concludes that the traditional regime was flexible and permissive, with the emphasis on maximum use and minimum interference in the exploitation of the ocean's natural resources. The author points out specific deficiencies which emphasize the obsolescence of the traditional system. In the author's opinion, the implications of his comments establish the need for some kind of central guidance system with respect to the regulation of ocean pollution. The author expands on the principal reasons for this kind of solution and the present obstacles to its implementation. (Gallagher-Florida)
W72-00233

INTERNATIONAL DEVELOPMENTS IN WATER POLLUTION CONTROL: PRINCIPLES OF RESPONSIBILITY: CONTINENTAL EUROPE,
Columbia Univ., New York.
G. J. Halasi-Kun.

In: Proceedings of the Conference on International and Interstate Regulation of Water Pollution, March 12-13, 1970, Columbia University School of Law, New York, New York, p. 40-49. 10 p, 1 append.

Descriptors: *Political aspects, *Water pollution control, *International law, *Project planning, Water pollution, Regulation, Water quality, Water quality control, Water pollution sources, Legal aspects, Jurisdiction, International commissions, International waters, Rivers, Public health, Water rights, Governments, Legislation.

The development of water pollution control in Europe is traced from ancient Roman times to the present. The medieval approach of neglecting and ignoring provisions for public hygiene and pollution control was finally brought to an end in 1831. In that year the Community of Paris reached a crude agreement on waste water disposal which represented the first public acceptance of the necessity of controlling pollution. The turning point in water usage control on an international basis occurred in 1856, when the European Commission on the Danube was organized to control navigation on the river. The status of water pollution control in Western and Eastern Europe since World War II is considered. Western Europe, with a greater water supply, developed water pollution control facilities on an individualistic approach, with emphasis on water ownership and riparian rights. Eastern Europe, however, employed agressive state action in the water pollution control area, thereby achieving a higher standard of water quality. The article concludes by analyzing the need for international cooperation in achieving effective water pollution control. (Horwitz-Florida)
W72-00234

GOALS AND STRATEGIES FOR COMBATING INTERNATIONAL POLLUTION,
American Society of International Law, Washington, D.C.
O. Schachter.
In: Proceedings of the Conference on International and Interstate Regulation of Water Pollution, March 12-13, 1970, Columbia University School of Law, New York, New York, p. 59-68. 10 p.

Descriptors: *Water pollution control, *Oceans, *International law, *Institutional constraints, Law of the sea, Shores, Oil, Water pollution sources, International waters, Legal aspects, Radioactive waste disposal, Water quality control, Mining, Oil fields, Exploitation, Organizations, Water policy, Data collection.

This address centered around what the international community ought to do and what is being done about the problem of water pollution, and more particularly marine pollution. The author discusses briefly some of the customary solutions of international law to the water pollution problem. The specific pollution problems of the seas include: (1) effects of pollution on coasts, (2) radioactive waste disposal, (3) oil cargo spillage, and (4) pollution from mineral and petroleum exploitation. Past international law pollution control measures have been ineffective; therefore, the author suggests: (1) a number of strengthened organizations, (2) some new forms or types of authority, (3) new institutional machinery, and (4) a great deal more effort in international collaboration. The author discusses these ideas, in terms of what seems to be needed at present, under several headings, including: (1) technical data collection systems, (2) new international law needed, (3) developing countries and the environmental issue, and (4) continuation of international pressure. (Gallagher-Florida)
W72-00235

INTERNATIONAL COOPERATION TO CURB FLUVIAL AND MARITIME POLLUTION,
R. R. Baxter.
In: Proceedings of the Conference on International and Interstate Regulation of Water Pollution, March 12-13, 1970, Columbia University School of Law, New York, New York, p. 73-77. 5 p.

Descriptors: *Water pollution control, *International law, *Institutional constraints, *Treaties, Oceans, Law of the sea, Water pollution sources, International waters, Legal aspects, Water quality control, Organizations, Water policy, Water pollution, Rivers, United Nations, Standards, Pollution abatement, Foreign countries.

According to this author, there are four principal themes that run through the development of the body of international law governing the prevention of water pollution. The first is the distinction which has hitherto been maintained between control of fluvial and lake pollution on the one hand and maritime pollution on the other. The second theme is the progression from those agreements that merely prohibit harm to another state through pollution to the agreements of more modern date that prescribe standards and provide for the taking of active measures against pollution. These agreements, in the third place, used to be bilateral ones but in recent times have become of a regional or multinational character. Finally, one sees a transition, related to these three previous themes, from mere treaty prohibitions to institutional arrangements. The author separetely traces the development of these four themes in the areas of: (1) river pollution, (2) marine pollution, and (3) regional arrangements. Having surveyed the past, the author indicates what must be done for the future. He believes that the solution lies in an International Environmental Authority to be established as a specialized agency of the United Nations. (Gallagher-Florida)
W72-00236

UNITED STATES MISSION TO THE UNITED NATIONS,
P. S. Thacher.
In: Proceeding of the Conference on International and Interstate Regulation of Water Pollution, March 12-13, 1970, Columbia University School of Law, New York, New York, p. 90-96. 7 p.

Descriptors: *United Nations, *International law, *Water pollution control, *Oceans, Legal aspects, Political aspects, Water pollution, Water conservation, Governments, Jurisdiction, Legislation, Waste disposal, Water pollution sources, Water pollution effects, Sea water, International commissions, International waters, Project planning, Public health.

International cooperation in curbing pollution of ocean waters beyond national jurisdictions is the major topic of this article. The sources and effects of ocean pollution are recognized as being an integral problem affected by man's increasing influence over the biosphere. To meet the problem of ocean pollution the United Nations is actively fostering international cooperation, especially at the stage of building man's knowledge and understanding of the oceans. A program under the direction of the Intergovernmental Oceanographic Commission of UNESCO is currently studying the following areas: (1) problems of ocean atmospheric interaction and circulation; (2) marine resources in their relation to the marine environment; (3) marine pollution; and (4) geology, geophysics and mineral resources beneath the sea. The article considers various programs presently in progress under United Nations supervision. Special attention is given to recent efforts by the United Nations in establishing fundamental legal principals concerning ocean pollution. The general approach adopted in the 1967 Treaty on Outer Space is providing an example for planners in the area of ocean pollution control. (Horwitz-Florida)
W72-00237

THE 1969 BRUSSELS CONVENTION ON CIVIL LIABILITY FOR OIL POLLUTION,
New York Univ., N.Y. School of Law.
N. J. Healy.
In: Proceedings of the Conference on International and Interstate Regulation of Water Pollution, March 12-13, 1970, Columbia University School of Law, New York, p. 105-113. 9 p.

Descriptors: *International law, *Political aspects, *Insurance, *Ships, Oil, Oil industry, Oil wastes, Transportation, Water pollution sources, Water pollution, International commissions, Integrnational waters, Governments, Jurisdiction, Compensation, Water pollution effects, Legislation.

The topic of insurance for marine oil pollution claims is divided into three basic categories: (1) claims for physical damage to shorefront property and other vessels, (2) claims for damage to intangible interests, and (3) claims for the cost of taking pregentive measures once a spill has occurred and for the cost of cleaning it up. The third category comprises the major area of consideration. The most serious issue in this area is presently the question of limitation of the amount of the shipowner's liability. The author concludes that some improvement should be made in our existing domestic law and in the laws of other maritime countries concerning the method of compensating those who suffer as a result of marine oil pollution, without placing an unbearable risk of loss upon the shipping industry. Methods presently being considered to meet this problem include an international revolving fund and the imposition of strict liability upon the cargo itself. The article concludes with a consideration of the strict liability plan adopted by the Conference at Brussels. (Horwitz-Florida)
W72-00238

POSITIVE INCENTIVES AND NEGATIVE CONTROLS,
D. E. Nicoll.
In: Proceedings of the Conference on International and Interstate Regulation of Water Pollution, March 12-13, 1970, Columbia University School of Law, New York, New York, p. 287-290. 4 p.

Descriptors: *Water policy, *Water pollution control, *Economic efficiency, *Evaluation, Water pollution, Water quality, Water quality control, Pollution abatement, Administrative agencies, Waste treatment, Taxes, Standards, Benefits, Monetary benefits, Treatment facilities, Waste water treatment.

Presently we are moving toward a more crowded society, oriented toward the consumption of goods and services and dominated by a desire for convenience, from the individual automobile to the garbage disposal. Our society is placing heavier demands on our resources and adding to the contimination of the environment. According to the author, it is in this atmosphere that more and more questions are being raised about the adequacy of existing techniques for control and abatement of pollution. Present law supports and relies on state, interstate and local action, with standby federal authority where the states fail to act. Its implementation depends on the sewage treatment construction grant program and legal enforcement of standards. Because the program hasn't kept pace with the revolution of rising environmental expectations and has suffered from a shortage of funds and inadequate establishment of priorities, the federal program has come under attack by resource economists and others. Therefore, the author discusses alternatives, including effulent taxes and incentives for waste treatment and a river basin system in which public agencies would collect and treat all wastes and then bill the dischargers for the cost. (Gallagher-Florida)
W72-00239

POSITIVE INCENTIVES AND NEGATIVE CONTROLS,
Delaware River Basin Commission, Trenton, N.J.
W. Miller.
In: Proceedings of the Conference on International and Interstate Regulation of Water Pollution, March 12-13, 1970, Columbia University Law School, New York, New York, p. 290-298. 9 p, 1 ref.

Descriptors: *Water pollution control, *Evaluation, *Future planning (Projected), *Institutional constraints, Water pollution, Water quality, Water quality control, Pollution abatement, Taxes, Economic efficiency, Legal aspects, Monetary benefits, Project planning, Resource allocation, Social aspects, Political aspects, Environmental sanitation, Public benefits, Water policy.

On the issue of positive incentives and negative controls for pollution abatement, the author divides his comments into six basic points. A systems approach to the problems of environmental quality should be the basis of water pollution control and abatement measures. The objectives and principles of cost allocation, rather than the reactions of the discharger, should determine the choice of enforcement method. The allocation of the limited assimilative capacity of a given body of water is a necessary step in the process. There is room for the use of improved conventional police power. If the taxing power is to be used, it should be distinguished from effluent charges, which are normally charges for a service. There is much room here to evaluate the spending power of government versus the spending power of the private sector. The author concludes that it is too early to select any one approach to the goal of pollution abatement. It is not necessary, however, to depend upon a carrot or stick approach when the entire society is now so responsive to environmental quality. (Gallagher-Florida)
W72-00240

INTRODUCTION OF A BILL TO AMEND THE CLEAN AIR ACT AND THE FEDERAL WATER POLLUTION CONTROL ACT,
Senate, Washington, D.C.
For primary bibliographic entry see Field 06E.
W72-00241

A BILL TO AMEND THE FEDERAL POLLUTION CONTROL ACT, AS AMENDED.
For primary bibliographic entry see Field 06E.
W72-00242

AN ACT TO BAN HIGH PHOSPHATE DETERGENTS.
For primary bibliographic entry see Field 06E.
W72-00244

AN ACT CONCERNING THE INSURANCE OR BONDING OF OIL COMPANIES AND CARRIERS.
For primary bibliographic entry see Field 06E.
W72-00245

CLEAN WATER FOR MISSISSIPPI'S ESTUARIES.

Summary, Mississippi Public Meeting, National Estuarine Pollution Study, January 17, 1968, Biloxi, Mississippi, Federal Water Pollution Control Administration, Atlanta, Georgia. 10 p, 5 photo.

Descriptors: *Mississippi, *Estuaries, *Environmental sanitation, *Water pollution control, Water resources development, Project planning, Pollution abatement, Feasibility studies, Administrative agencies, Interstate commissions, Fishing, Recreation demand, Industries, Water users, Federal government, Water quality control, Standards, Waste disposal, Waste treatment, Treatment facilities, Oysters, Commercial fishing.
Identifiers: *Federal Water Pollution Control Administration, *Clean Water Restoration Act of 1966, National Estuarine Pollution Study.

The Clean Water Restoration Act of 1966 authorized the National Estuarine Pollution Study to be conducted by the Federal Water Pollution Control Administration. At public meetings, estuarine water users' views concerning the problems of water pollution control were considered. These statements are herein summarized in seven categories: planning, responsibility, commercial fishing, industry, navigation, recreation, and research. Various Mississippi planning commissions have conducted long-range studies regarding population growth, economic potential, and land use analysis. Further detailed studies will look at tourism, industrial development potential, and the role of public utilities in controlling water pollution. Mississippi continues to assume more responsibility in pollution control through intrastate and interstate cooperation. Criticism is directed at the federal government's failure to consult with state agencies and allow them to enforce regulations. Both commercial fishing and industrial interests recognized the necessity of better waste treatment processes and more realistic water quality standards and monitoring efforts. Several groups spoke about the deleterious effects of water pollution upon the recreation potential of Mississippi. The Gulf States Marine Fisheries Commission and other research groups commented on estuarine programs presently being conducted. (Rees-Florida)
W72-00246

GREAT LAKES POLLUTION,
J. D. Dingell.
In: The Great Lakes--How Many Masters Can They Serve. 11th Annual Conference, Michigan Natural Resources Council, Lansing, Michigan, p 19-26, October 1968. 8 p.

Descriptors: *Water pollution sources, *Water pollution control, *Pollution abatement, *Great Lakes, Water pollution, Water pollution effects, Water quality, Water quality control, Pollutants, Environmental sanitation, Water policy, Lake Erie, Lake Huron, Lake Ontario, Lake Michigan, Lake Superior, Federal government, State governments, Local governments, Cities, Standards, Regulation.

Federal action is necessary to control and abate pollution: state and local governments do not have the resources, and pollution is not merely a local problem. The following factors constitute the major problems facing the Great Lakes; (1) overenrichment, (2) a buildup of dissolved solids, (3) bacterial contamination, (4) chemical contamination from industrial waste discharges, and (5) oxygen depletion. The present state of pollution of each of the Great Lakes is explained. Water pollution can be controlled. All of the states and territories have filed letters of intent to establish water quality standards. A list of sixteen immediate actions necessary to save the Great Lakes is set forth. The Secretary of Interior should have the authority to set standards for intra-state waters as well as interstate. (Robinson-Florida)
W72-00247

TANKER OWNERS VOLUNTARY AGREEMENT CONCERNING LIABILITY FOR OIL POLLUTION.
For primary bibliographic entry see Field 06E.
W72-00248

JURISDICTION OF THE DEPARTMENT OF AIR AND WATER POLLUTION CONTROL,
For primary bibliographic entry see Field 06E.
W72-00249

PRINCIPLES OF RESPONSIBILITY IN INTERNATIONAL LAW,
Columbia Univ., N.Y. School of Law.
For primary bibliographic entry see Field 06E.
W72-00251

LAWYERS AS HUMAN ENVIRONMENTALISTS ADVOCATE'S ENVIRONMENTAL ADVICE,
For primary bibliographic entry see Field 06E.
W72-00252

THE USE OF THE CORPS OF ENGINEERS PERMIT AUTHORITY AS A TOOL FOR DEFENDING THE ENVIRONMENT,
Stanford Univ., Palo Alto, Calif. School of Law.
D. M. Casto, III.
Natural Resources Journal, Vol 11, No 1, p 1-47, 1971. 47 p, 134 ref.

Descriptors: *Water pollution control, *Water quality control, *Water permits, *Rivers and Harbors Act, *Legislation, Environmental engineering, Water pollution sources, Water pollution effects, Federal government, Administrative agencies, Navigable waters, Navigation, Ships, Docks, Structures, Sewage effluents, Thermal pollution, Oil wastes, Discharges (Water), Municipal wastes, Banks, Water policy, Wildlife conservation, Damages, Remedies.

The Army Corps of Engineers' permit authority is examined as being the best tool available to regulate national water resources. The statutory background for this authority includes: (1) section 10 of the Rivers and Harbors Act, particularly that part defining 'any obstruction' and 'navigation'; (2) section 13 of the Refuse Act, defining 'refuse' and exceptions to that broad definition; (3) the Fish and Wildlife Coordination Act, which emphasizes consideration of environmental factors in permit applications; (4) the National Environmental Policy Act; and (5) the Water Quality Improvement Act of 1970. Administrative factors examined include the Memorandum of Understanding coordinating permit application processing between the Corps of Engineers and the Interior Department, and the Corps' permit regulations. The permit procedure and its disadvantages are discussed, particularly respecting: (1) offshore drilling, (2) administrative inaction or malfeasance, (3) poor interagency coordination, (4) questionable strength of penalties, and (5) purposeful delays in permit applications. Private litigation is discussed with respect to the qui tam procedure that fosters citizen participation by returning one-half of levied fines to informers and procedural problems of standing and burden of proof. (Rees-Florida)
W72-00253

OIL POLLUTION CONTROL IN THE CANADIAN ARCTIC,
Ottawa Univ. (Ontario).
D. Pharand.
Texas International Law Journal, Vol 7, No 1, p 45-72, Spring 1971. 85 ref.

Descriptors: *International law, *Arctic Ocean, *Oil, *Water pollution control, Water pollution, Water pollution sources, Foreign countries, Oil industry, Exploration, Exploitation, International waters, Foreign waters, Treaties, International commissions, Water quality, Water quality control, Pollutants, Pollution abatement, Legislation, Regulation, Arctic, Polar regions, Water pollution effects.

Along with the Torrey Canyon and Santa Barbara Channel incidents, the Prudhoe Bay discovery and the Manhattan Northwest Passage have caused concern over oil pollution in the Arctic. The various international conventions have not been adequate to dispel the Canadian fear of Arctic oil pollution. The 1954 London Convention for Prevention of Pollution of the Sea by Oil does not cover accidental pollution. The Intergovernmental Maritime Consultative Organization (IMCO) Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Damage recognizes the right of a coastal state to self-protection from pollution, but restrictions on intervention inhibit its effectiveness. Furthermore, provisions of the Convention on Civil Liability for Oil Pollution Damage are inadequate protection for Canada. Hence the Canadian Arctic Waters Pollution Prevention Act imposes strict liability for arctic pollution; proof of financial responsibility may be required and shipping safety control zones may be established. A pollution prevention officer will have extensive powers. Canada contends the Act is consistent with international law because: (1) freedom of the high

seas is inapplicable to arctic waters, (2) the Northwest Passage is not an international strait, and (3) the Act is based on self-defense. (Hart-Florida)
W72-00254

FEDERAL WATER POLLUTION LEGISLATION AND REGULATIONS WITH PARTICULAR REFERENCE TO THE OIL INDUSTRY,
Gulf Oil Co., Houston, Tex.
K. C. Keener.
Natural Resources Lawyer, Vol 4, No 3, p 484-504, July 1971. 21 p, 129 ref.

Descriptors: *Federal government, *Water pollution control, *Oil industry, *Legislation, Legal aspects, Rivers and Harbors Act, Water Quality Act, State governments, Regulation, Standards, Water pollution, Water pollution sources, Water pollution effects, Water quality, Water quality control, Pollutants, Pollution abatement, Remedies, Administrative agencies, Administration.
Identifiers: *Federal Water Pollution Control Act.

Federal water pollution legislation and regulations have become increasingly complex. The Federal Water Pollution Control Act was enacted in 1948 and provides a comprehensive scheme of water pollution control. A joint federal-state enforcement program is established by the Act, under which the state has the initial burden of implementing regulatory plans. Federal authorities may act only when the state fails to act or requests assistance. Section II of the Act was introduced by the Water Quality Improvement Act of 1970, and it uses a different scheme to combat oil pollution. In addition to interstate and navigable waters, section II applies to waters in the contiguous zone. A violator of section II is liable for clean-up costs of oil discharges, and a $10,000 civil penalty may be imposed for knowing violation. The Refuse Act of 1899 also prohibits oil discharges in navigable waters; prosecution may be sought under it although water quality standards are not violated. The Outer Continental Shelf Lands Act regulates pollution from oil and gas exploration and production in offshore waters. Furthermore, the Hazardous Materials Act, the fish and Wildlife Coordination Act, and the National Environmental Policy Act are involved in regulating pollution. (Hart-Florida)
W72-00255

SUING THE POLLUTER: APPROACHES TO ACHIEVE STANDING,
C. J. Blake.
Alaska Law Journal, Vol 9, No 5, p 47-66, May 1971. 20 p, 116 ref.

Descriptors: *Pollution abatement, *Remedies, *Environmental sanitation, *Adjudication procedure, *Public rights, Judicial decisions, Legal aspects, Legislation, Water pollution, Air pollution, Ecology, Federal government, Taxes, Conservation, Natural resources, Institutional constraints.

Before one may sue a polluter he must establish standing to sue. Methods of achieving standing, and the problems inherent in each approach are discussed in this article. Leading cases in each area are evaluated. Traditional remedies such as tort law and public nuisance abatement suits present numerous obstacles. Standing in a taxpayer's suit depends upon the type of injury and the nature of the defendant. The Administrative Procedure Act provides a remedy against the federal government without the uncertainty accompanying a taxpayer's suit. Conservation minded shareholders may bring shareholders' derivative suits. A possible basis for a suit against unincorporated or closely-held corporations would be a suit under the civil rights statutes. This is a novel approach which courts may be reluctant to accept. A writ of mandamus is a possible remedy against either a private or governmental polluter. Some of the approaches suggested in this article will work better in given situations than others. The taxpayer's suit and the Administrative Procedure Act should be used whenever possible. If these remedies cannot be used, the shareholder's derivative suit should be used. The civil rights approach and mandamus should be used only as a last resort. (Robinson-Florida)
W72-00256

TORT LIABILITY AND THE OIL AND GAS INDUSTRY,
Texas Univ., Austin. School of Law.
P. Keeton, and L. Jones, Jr.
Texas Law Review, Vol 35, No 1, p 1-19, November 1956. 64 ref.

Descriptors: *Texas, *Oil industry, *Damages, *Remedies, Oil, Oil fields, Oil wastes, Drilling, Natural gas, Livestock, Land tenure, Leases, Judicial decisions, Legal aspects, Water pollution sources, Water pollution effects.

The escape of deleterious substances during the various phases or petroleum production has resulted in damages to real and personal property. When litigation develops, the initial question is whether the damage was sustained by the leased premises or by adjacent land. Mineral leases create in the lessee the dominant estate in the land's surface. Thus, the lessee is permitted to occupy such space and do such damage as is reasonably necessary to conduct the operations permitted by the lease. Generally, the operator is not liable for injury to the livestock of an agricultural lessee because he is under no duty to fence off his wells. Additionally, the operator is not liable for damages caused by the unintentional escape of deleterious substances absent proof of negligence. Because this is a common situation, a detailed discussion is made on this point. Since the burden of proof is on the lessor or the agricultural lessee to prove negligence, the res ipsa loquitur doctrine has been allowed in proving negligence. (Shelnut-Florida)
W72-00257

PULP-MILL WASTE-WATER DISCHARGES INTO PUGET SOUND: AN INDUSTRY VIEWPOINT,
Northwest Pulp and Paper Assocation, Seattle, Wash.
D. J. Benson.
Water Resource Management and Public Policy (ed T. H. Campbell and R. O. Sylvester), p 187-195, 1968. 9 p.

Descriptors: *Washington, *Pulp wastes, *Sulfite liquors, *Water quality control, Legislation, Legal aspects, Industrial wastes, Chemical wastes, Water pollution, Water pollution sources, Water pollution effects, Water pollution control, Water quality, Administration, Administrative agencies, Standards, Permits, Regulation, Water law, Pulp and paper industry.

A great deal of difficulty has been encountered in attempting to get Puget Sound's sulfite pulp mills to recover spent sulfite liquors harmful to fish and oysters. If management and public agencies can agree on the problem a rational and technical solution is more likely than if legal enforcement is used. A basic concept of water quality control is the theory of downstream beneficial use which means that upstream residents will control discharges to avoid the impairment of downstream beneficial uses. Examples of beneficial uses and contaminants are listed. Enforcement consists of a continual assessment of water quality and beneficial uses and the development of waste discharge requirements. Reasonable control measures should also be established. Industrial problems and industrial reasons for choosing locations are discussed. Planning is necessary to determine the potential of a basin for supporting industry. Zoning could be used to help achieve the maximum beneficial use of water resources. As water resource use increases, cities and manufacturers must go to higher levels of discharge control, but they must plan to prepare for this. (Robinson-Florida)
W72-00258

PROPOSED REGULATIONS OF THE DEPARTMENT OF INTERIOR ON OIL POLLUTION UNDER THE WATER QUALITY IMPROVEMENT ACT OF 1970.
Hearing--Subcomm on Air and Water Pollution--Comm on Public Works, US Senate, 91st Cong, 2d Sess, August 4, 1970. 44 p, 3 tab.

Descriptors: *Water Quality Act, *Oil wastes, *Water pollution control, *Legal aspects, Navigable waters, United States, Administrative agencies, Federal government, Water quality control, Standards, Discharge (Water), Water pollution sources, Acid mine drainage, Pesticides, Environmental effects, Waste treatment, Treatment facilities, State jurisdiction, Investigations, Planning, Public health, Pollution abatement, Budgeting, Government finance.

In order to implement the Water Quality Improvement Act, the Department of the Interior proposed regulations on oil pollution discharges into navigable waters. The Senate Subcommittee on Air and Water Pollution conducted a hearing to determine the effect of sections 610.6, 610.9 of these regulations regarding the exclusion of 'de minimis discharges' from the prohibition against discharging oil in 'harmful quantities' as provided by section 11 (b) (3) of the Act. The Subcommittee considered whether these sections were directly contrary to congressional intent in the Act. Section 610.6 would require a properly functioning vessel to report under a notice provision de minimis discharges, which obligation Congress believed to be burdensome. The section also establishes exclusions to an otherwise strict liability for discharges. The Subcommittee believed the proposed regulations, by not incorporating the precise statutory language regarding specifically excepted areas of water activity, had drastically modified the express intent of Congress. Exclusions from the 'harmful quantities' definition were limited to discharges: (1) from properly functioning vessels, (2) from acts of third parties, (3) from Acts of God, (4) when necessary to save human life, and (5) those permissibly allowed in contiguous zones. (Rees-Florida)
W72-00259

LOANS TO RURAL AREAS FOR WATER SUPPLY AND SEWAGE DISPOSAL SYSTEMS.
Hearing - Subcomm on Conservation and Credit - Comm on Agriculture, House of Representatives, 89th Cong, 1st Sess, July 29, 1965. 67 p, 4 tab.

Descriptors: *Rural areas, *Water supply, *Sewage disposal, *Federal government, *Loans, Grants, State governments, Sewage treatment, Treatment facilities, Construction costs, Design standards, Water storage, Water treatment, Water purification, Drainage systems, Irrigation, Easements, Economic feasibility, Water rights, Domestic water, Farms, Soil conservation, Legislation.
Identifiers: *Farmers Home Administration Act of 1961.

The House Subcommittee on Conservation and Credit of the Committee on Agriculture held a hearing to discuss legislation which would amend the Consolidated Farmers Home Administration Act of 1961. The amendment authorizes the Secretary of Agriculture to make or insure loans, not exceeding five million dollars, to public and quasi-public agencies and non-profit corporations for water supply and water systems serving rural areas. The secretary would be authorized to make grants in aid, not exceeding twenty-five million in any fiscal year, to finance community development projects for water storage treatment, purification, and distribution. The amendment also increases the limit on insurable loans from two-hundred to four hundred and fifty million dollars. It would also increase the amount of loans which the Secretary can hold at any one time for future sale from the present twenty-five million to fifty million dollars. A rural area is defined as one primarily engaged in or associated with agriculture and having a population of not more than 5,000. The present population limitation of 2,500 primarily serves farmers

and other rural residents. Statements and correspondence submitted to the Subcommittee are set forth. (Rees-Florida)
W72-00260

INTERFERENCE WITH STREAMS AND WATERS; PROTECTION OF FISH AND GAME.
For primary bibliographic entry see Field 06E.
W72-00261

WATER POLLUTION CONTROL ACT.
For primary bibliographic entry see Field 06E.
W72-00262

POLLUTION CONTROL AGENCY.
For primary bibliographic entry see Field 06E.
W72-00263

LICENSING AND REGULATION OF USE OF OIL SPILL CLEANUP AGENTS.
For primary bibliographic entry see Field 06E.
W72-00264

SEWAGE DISPOSAL.
For primary bibliographic entry see Field 06E.
W72-00265

SALES AND USE TAX.
For primary bibliographic entry see Field 06E.
W72-00266

WATER POLLUTION CONTROL.
For primary bibliographic entry see Field 06E.
W72-00267

POWER FOR TOMORROW: THE SITING DILEMMA,
Consolidated Edison Co. of New York, Inc., N.Y.
C. F. Luce.
Environmental Law, Vol 1, No 1, p 60-71, Spring 1970. 12 p, 27 ref.

Descriptors: *Sites, *Electric power production, *Environmental effects, *Administrative decisions, Powerplants, Adjudication procedure, Legal aspects, Permits, Regulation, State governments, Local governments, Federal government, Jurisdiction, Water pollution sources, Administrative agencies, Legislation, Power system operations, Electric power demand, Thermal pollution, Environmental engineering, Transmission lines, Nuclear powerplants, Hudson River, Water pollution control, New York.

Society is faced with the dilemma of incompatibility between two social goals: protection of the environment and the production of electricity. Part of this dilemma is the decision of where to place production facilities. Examples are given which illustrate environmental objections to power plant siting. Many required approvals from governmental agencies for a new power plant involve environmental issues. A final negative decision on any point can cancel an entire project. The procedure followed in obtaining a permit from the Atomic Energy Commission is illustrated. Such a permit is only one of many required for building or operating a new power plant. Laws governing the construction of such plants are weak. There is no coordinated, systematic review by a single regulatory agency in which all the factors necessary to a wise decision are considered. Revision of these laws should provide for an early public hearing, expeditious judicial review, and administrative review of advance plans. One of the most difficult problems to overcome would be the alteration of jurisdiction currently held by federal, state, and local agencies. In the long run, the resolution of the siting dilemma will be found in better public understanding of the issues involved, not in administrative innovation. (Johnson-Florida)
W72-00269

THE CHALLENGE OF ENVIRONMENTAL QUALITY: AN OUTLINE OF REMEDIES TO MEET IT,
N. Peterson, and R. Lawrence.
Environmental Law, Vol 1, No 1, p 72-91, Spring 1970. 20 p, 94 ref.

Descriptors: *Remedies, *Environmental sanitation, *Oregon, *Pollution abatement, *Damages, Permits, Legal aspects, Regulation, Administrative agencies, Jurisdiction, Water rights, Administration, State governments, Water pollution, Condemnation, Easements, Environmental effects, Adjudication procedure, Water quality control, Water utilization, Standards, Water pollution control, Judicial decisions.
Identifiers: *Public trust doctrine.

Among the legal remedies for pollution in Oregon are the following: (1) administrative remedies, (2) private law enforcement, (3) civil remedies for injuries to land, and (4) civil remedies for personal injuries. An administrative agency has been set up to protect Oregon's waters. A permit from this agency is required before wastes may be discharged. Private law enforcement includes mandamus to require the appropriate public official to carry out his duties and the personal presentation of a complaint before a grand jury. Civil remedies for injuries to land allow a party to enjoin the continuation of pollution or recover damages caused by pollution. Injunctions may be obtained under nuisance, trespass, or the public trust doctrine theory. Recovery for damage to land may be obtained when the injury results from a nuisance, trespass, or inverse condemnation. In limited situations, punitive damages may also be awarded. Civil remedies for personal injury include nuisance, trespass, negligence, and possibly battery. All of these remedies and their application to pollution problems are discussed in the article. Such rights and remedies may be useful in meeting the environmental challenge of our times. Lawyers with courage and energy can meet this challenge. To fail may, and probably will, result in the death and destruction of mankind. (Johnson-Florida)
W72-00270

PRIVATE ACTION UNDER THE PUBLIC TRUST: AN ENVIRONMENTAL BILL OF RIGHTS FOR CALIFORNIA,
S. P. Chambers.
Pacific Law Journal, Vol 2, No 2, p 620-634, 1971. 15 p, 87 ref.

Descriptors: *California, *Public rights, *Pollution abatement, *Political aspects, Legal aspects, Legislation, Water pollution, Water pollution control, Judicial decisions, Public health, Air pollution, Water quality control, Jurisdiction, Relative rights, State governments.
Identifiers: *Public trust doctrine.

The public trust doctrine is considered as a means for private individuals to combat California's pollution problems. The present role of private litigation in pollution control is considered, with emphasis on: (1) private nuisance actions, (2) actions based on trespass, (3) actions based on negligence, (4) the doctrine of strict liability, and (5) actions based on federal anti-trust legislation. These theories are deemed inadequate to deal with the problems of pollution control. The public trust doctrine is put forth as a reasonable alternative that can allow private actions in pollution abatement. In its most simple form, the public trust concept means that certain resources are held by the state in trust for all the people, and that such resources cannot be dissipated. The development of this doctrine is analyzed from its beginnings in early Roman and English law to recent California judicial decisions. The article then examines the strengths and weaknesses of the Michigan Environment Protection Act, which adopted the public trust doctrine, and recommends an improved version of this legislation for California. (Horwitz-Florida)
W72-00272

PROTECTION OF INLAND WETLANDS; DISCHARGE OF WASTE OR DELETERIOUS SUBSTANCES.
For primary bibliographic entry see Field 06E.
W72-00274

ACQUISITION OF SURFACE LANDS FOR WATER QUALITY CONTROL.
For primary bibliographic entry see Field 06E.
W72-00275

MINERAL WELL ACT.
For primary bibliographic entry see Field 06E.
W72-00276

THOMAS J. ANDERSON, GORDON ROCKWELL ENVIRONMENTAL PROTECTION ACT OF 1970.
For primary bibliographic entry see Field 06E.
W72-00277

PUBLIC BATHING BEACHES.
For primary bibliographic entry see Field 06E.
W72-00278

IN THE MATTER OF MERCURY STANDARDS.

Opinion of the Board, No. R70-5, Illinois Pollution Control Board, Springfield, Illinois, March 31, 1971. 11 p.

Descriptors: *Illinois, *Chemical wastes, *Standards, *Water pollution control, Fish, Public health, Pollution abatement, Water pollution, Air pollution, Water pollution sources, Water pollution effects, Administration, Administrative agencies, Regulation, Legal aspects, Political aspects, State governments, State jurisdiction, Waste disposal, Waste treatment, Industrial waste, Sewage treatment, Metals, Inspection, Permits.

The pollution control board sets forth the factors that prompted the adoption of mercury control regulations, an evaluation of the present and future effectiveness of the regulations, and possible future changes in the regulation. The board established the maximum mercury concentration in water at 0.005 micrograms per liter. This standard was thought to provide a margin of safety against direct adverse effects of mercury in the water, protection against the occurrences of unsafe concentrations of mercury in fish, protection against degradation of waters presently relatively free of mercury, and a reasonably accurate standard for measurement without undue expense. The board felt that all mercury discharges should be kept as low as is reasonably possible because mercury is: (1) so highly toxic, (2) not degradable, (3) biologically concentrated in fish, and (4) readily converted to its most toxic form. The principal underlying the regulation is that no discharge of mercury shall be allowed unless it is essentially unavoidable. The technical feasibility and economic reasonableness of this strict effluent limitation on mercury is considered in relation to chlor-alkali manufacturing, laundry operations, hospitals, various laboratories, and the paint industry. (Horwitz-Florida)
W72-00279

INTERNATIONAL LAW AND POLLUTION OF INTERNATIONAL RIVERS AND LAKES,
British Columbia Univ., Vancouver. School of Law.
C. B. Bourne.
British Columbia University Law Review, Vol 6, No 1, p 115-136, June 1971. 22 p, 68 ref.

Descriptors: *Water pollution control, *Water quality control, *International waters, *River basin development, Water pollution, Water quality, Pollution abatement, International commissions, International Joint Commission, International law, Treaties, Water law, Legal aspects, Water policy, Air pollution, Lakes, Rivers, River basins.

The problem of maintaining a useable water supply in the future is discussed. The law governing water quality in international rivers is rooted in the law of international water resources. Rules and theories of this international law are presented. The Helsinki Rules adopted by the International Law Association deal with water pollution of international drainage basins; these rules are evaluated and explained. The Trail Smelter Arbitration between the United States and Canada is examined, and it is found that the problems of international air pollution are analogous to those of international water pollution. Certain American interstate litigation is discussed, as is the International Joint Commission created by Canada and the United States. International water pollution law consists of rudimentary principles. It is unlikely that regional customary law will solve existing problems. Existing customary law on pollution of drainage basins will probably be displaced by treaties providing for management and control of international drainage basins by international joint agencies. (Robinson-Florida)
W72-00280

OIL POLLUTION PROBLEMS ON THE PACIFIC COAST,
British Columbia Univ., Vancouver. School of Law.
J. D. Dunn, and J. A. Hargrave.
British Columbia Law Review, Vol 6, No 1, p 137-165, June 1971. 115 ref.

Descriptors: *Water pollution control, *Oil, *Pacific Ocean, *Foreign countries, Water pollution, Water pollution sources, Water pollution effects, International law, International waters, Legislation, Treaties, Pollutants, Oil industry, Ships, Washington, Arctic Ocean, Arctic, Remedies, Legal aspects, Judicial decisions.

British Columbia has not been threatened by oil pollution on a large scale; nevertheless, the increasing number of tankers and the Torrey Canyon disaster emphasize the necessity for protection of the Pacific Coast from oil pollution. Admiralty jurisdiction is readily available over vessels, and liability arises from the seaworthiness doctrine. Under existing common law, liability may arise from trespass, nuisance, negligence, or strict liability under the doctrine established by Rylands v. Fletcher. Negligence is the best common law remedy, but its effectiveness is diminished by the proximate cause and foreseeability doctrines of In Re Polemis and the Wagon Mound. Canadian federal law has dealt with oil pollution in a piecemeal fashion. Nevertheless, the Arctic Waters Pollution Prevention Act may provide comprehensive controls. British Columbia provincial legislation is not directed to oil pollution of the sea. International conventions also provide inadequate control of oil pollution at sea. The Washington State Act provides strict liability for oil pollution, but it, like other recent laws, does not provide adequate preventive measures. Amendments to the Canadian Shipping Act, not yet in force, however, provide broad powers to deal with accidents. (Hart-Florida)
W72-00281

HOW WE GOT THE DIRTIEST STREAM IN AMERICA,
House of Representatives, Washington, D. C.
B. Eckhardt.
Texas International Law Journal, Vol 7, No 1, p 5-28, Spring 1971. 24 p, 42 ref.

Descriptors: *TEXAS, *Pollution abatement, *Cities, *Water pollution control, Water quality control, Local governments, State governments, Administrative agencies, Administration, Administrative decisions, water pollution, Water pollution sources, Water pollution treatment, Regulation, Standards, Industrial wastes, Federal government, Rivers and Harbors Act, Legal aspects, Legislation, Judicial decisions, Political aspects, Political constraints.
Identifiers: *Houston ship channel.

The Houston Ship Channel is polluted by both industry and the city of Houston. Although a joint city-county pollution control program was initiated in 1953, it failed because the various governments failed to provide financial support. Houston's own sewage plants were primary pollution contributors. Various industries also caused much of the pollution. Texas courts, however, held that a corporate executive could not be liable for pollution if a subordinate may have actually been responsible. They also held that corporations cannot be criminally prosecuted. Hence, corporations were free to pollute at will. Legislation was proposed to correct this situation, but it was emasculated through effective lobbying and amendments. The Texas Pollution Control Act was finally passed. It created a control board composed of members representing polluting industries. The federal pollution abatement program has also been ineffective, but prosecutions have recently begun under the Refuse Act. Houston itself has an encouraging new abatement program, and the county has recently won prosecutions, although state action is still ineffective. Amendments to state law and revised federal water quality standards are needed. (Hart-Florida)
W72-00282

MAINE'S OIL SPILL LEGISLATION: CAN A STATE WITH AN EXTENSIVE INTEREST IN ITS COASTAL RESOURCES PROTECT ITSELF FROM INADEQUACIES IN NATIONAL AND INTERNATIONAL LAW,
Office of the Governor, Augusta, Ma.
P. A. Bradford.
Texas International Law Journal, Vol 7, No 1, p 29-43, Spring 1971. 15 p, 35 ref, 1 append.

Descriptors: *Maine, *Oil industry, *Federal jurisdiction, *Water pollution control, Oil, Water pollution sources, Water pollution, Water pollution effects, Damages, Legal aspects, Legislation, Pollutants, Ships, Harbors, Federal government, State governments, Foreign countries, Treaties, Foreign trade, Import, Export, International law, State jurisdiction, Remedies, Coasts.
Identifiers: *Constitutionality.

Maine recently enacted the most comprehensive oil spill control law in the United States. Maine has the only deep water ports on the Eastern Seaboard capable of discharging supertankers. The law was enacted to protect the coastline while obtaining the benefits accompanying the oil industry. The law creates a system of liability and damage payments, more stringent than federal law, and establishes a Coastal Protection Fund funded through an excise tax. Oil spill prevention and control activities are conducted by the fund, and it may be used to pay damages to spill victims. In that instance, the fund may proceed against a tanker, charterer, owner, operator, or terminal operator. Potential conflicts exist, however, with three areas of federal jurisdiction: (1) the Limitation of Liability Act, (2) the Commerce Clause, and (3) the Import-Export Clause. Nevertheless, the Maine Act probably surmounts these obstacles. The Act would be superseded if the United States accedes to the International Convention on Civil Liability for Oil Pollution Damage, but the provisions of the Convention are less stringent than the Maine Act. Pertinent provisions of the Act are set forth in the Appendix. (Hart-Florida)
W72-00283

RULES AND REGULATIONS FOR THE DEVELOPMENT, SUBMISSION AND ADOPTION OF WATER POLLUTION CONTROL AND ABATEMENT PLANS FOR SEWAGE DRAINAGE BASINS.
Washington State Dept. of Ecology, Olympia.

2d edition, 1970. 8 p, 2 map.

Descriptors: *Washington, *Water pollution control, *Sewage disposal, *Planning, Pollution abatement, Water quality control, Regulation, Administrative agencies, Coordination, Standards, Treatment facilities, Water conservation, Air pollution, Construction costs, Legislation, Legal aspects, State governments, Hydrology, Adoption of practices.

The rules and regulations herein set forth are intended to protect and preserve present and future water quality and be consistent with quality standards for interstate and intrastate waters. Within each basin an agency is responsible for coordinating water pollution control and abatement planning efforts and shall prepare a water pollution control and abatement plan. Before undertaking specific planning efforts, the agency should consider the following factors: (1) the physical environment, (2) social and economic growth, (3) an inventory of existing facilities and sources of wastes, (4) present and future water pollution control needs, and (5) water pollution sources. Other factors to be considered include: interim and alternative implementation measures, the criteria governing sewer line extensions, and other phases of environmental quality. A planning guide is provided to aid in preparing the plan. Any capital improvement program should include an approximate construction schedule, cost estimates, and financial arrangements. The Water Pollution Control Commission will recognize three basic phases of planning: (1) control and abatement plans, (2) preliminary engineering reports, and (3) construction plans and specifications. Procedures for the adoption of plans are detailed. (Shelnut-Florida)
W72-00284

RULES AND REGULATIONS FOR MINERAL EXPLORATION.
For primary bibliographic entry see Field 06E.
W72-00285

MULTI-MEDIA CONFRONTATION--THE ENVIRONMENTALIST'S STRATEGY FOR A 'NO--WIN' AGENCY PROCEEDING,
I. Like.
Atomic Energy Law Journal, Vol 13, No 1, p 1-26, Spring 1971. 26 p, 35 ref.

Descriptors: *Administrative agencies, *Administrative decisions, *Political aspects, *Environmental sanitation, Social aspects, Social impact, Education, Environment, Administration, Regulation, Legislation, Legal aspects, Water pollution control, Technology, Social needs, Social values, Social change, Social function, Public rights, Relative rights, Non-structural alternatives.

A citizen environmental group is faced with formidable legal and practical difficulties if it attempts to challenge the issuance of a construction permit for a nuclear powerplant by the Atomic Energy Commission. A lack of funds and the unavailability of expert witnesses are problems. The legal doctrines of exhaustion of administrative remedies, the final order rule, and the substantial evidence rule also present problems. Recent federal environmental legislation has aided such groups. The administrative challenge should be brought regardless of the chance of winning, because it is necessary to inform the public of adverse environmental effects. Prospective polluters may also abandon their plans. The intervenor should use the media to transmit the truth to the public. He should attempt to make the hearings as dramatic and interesting as possible. Technology, as well as environmental effects, should be challenged. A team of lawyers, technical consultants, lay interrogators, evidence gatherers, and political activists is necessary. Cross examination by the attorney and the lay interrogator is an excellent tool in administrative hearings. The right to counsel for indigent intervenors in environmental hearings should be guaranteed. (Robinson-Florida)
W72-00286

NEW ENGLAND INTERSTATE WATER POLLUTION CONTROL COMMISSION.
New York Public Health Law, secs. 1181 thru 1188 (McKinney 1971).

Descriptors: *New York, *New England Interstate WPS Compact, *Water quality control, *Sampling, Testing, Administrative agencies, Personnel, State jurisdiction, Pollution abatement, Public health, Budgeting, Estimated costs, Financial analysis, Water demand, Water utilization, Treatment facilities, Waste treatment, Waste disposal, Recreation demand, Permits, Interstate rivers, Legal aspects, Regulation, Water pollution control.

New York's participation in the New England Interstate Water Pollution Control Commission is detailed. Membership on the Commission shall be through appointment by the governor. The tenure of its members and their powers are specified. A budget from the Commission shall include requests for appropriation of funds from the state and the other member states. The state agrees to contribute the requested amount. Further provisions include: (1) examination by the state comptroller of the Commission's accounts and books; (2) appraisal by the commissioner of health evaluating the Commission's role respecting interstate waters concerning New Yrok; (3) the conferring of additional powers on the Commission by consent of member states; (4) establishment of a water quality network, utilizing a testing and sampling program of interstate and intrastate waters; and (5) remedial action to control and abate water pollution from improper waste discharges. Unless authorized by law, the Commission shall not have power to issue permits for waste discharges or pass upon plans or specifications for particular waste treatment facilities. (Rees-Florida)
W72-00287

PARKS AND RECREATION--SANITATION.
Washington Administrative Code, sec 352-32-180 (Supp 1971). 1 p.

Descriptors: *Washington, *Parks, *Recreation wastes, *Water pollution control, Water pollution, Regulation, State governments, State jurisdiction, Camping, Conservation, Land use, Legal aspects, Water pollution sources, Wastes, Domestic wastes, Recreation, Public health, Recreation facilities, Adoption of practices.

No person shall, in any State Park Area: (1) drain or dump refuse or waste from any trailer, camper, automobile, or other vehicle, except in designated disposal areas or receptacles; (2) clean fish or other food, or wash any clothing or other article for personal or household use, or any dog or other animal except at designated areas; (3) clean or wash any automobile or other vehicle except in specified areas; or (4) pollute, or in any way contaminate by dumping or otherwise depositing therein any waste or refuse of any nature, including human or animal waste, any stream, river, lake, or other body of water running in, through, or adjacent to, any State Park Area. (Horwitz-Florida)
W72-00288

OIL UPON THE WATERS,
D. M. R. Esson.
Journal of the Law Society of Scotland, Vol 16, No 6, p 123-125, June 1971. 28 ref.

Descriptors: *International law, *Ships, *Water pollution, *Oily water, Political aspects oil, Oil wastes, Pollution abatement, Water pollution control, Oceans, Legislation, Admiralty, Oil industry, International commissions, Legal aspects, International waters, Jurisdiction, Salvage value, Governments, Foreign countries, Foreign waters.
Identifiers: *England.

The problem of oil pollution resulting from incidents involving oil tankers is considered in this article. Special attention is given to the role that the international law of salvage plays in saving such ships and its relationship to recent disasters. International law is presently inadequate to protect countries, especially England, from disasters resulting from massive tanker leaks. New English legislation to handle such emergencies is considered and deemed a vast improvement over present international law. The new legislation empowers the Secretary of State to take whatever steps are necessary to prevent large scale oil pollution. This includes the right to sink or otherwise destroy a ship. Although this legislation was prompted by the likelihood of serious pollution in the English channel, its provisions may be very useful in handling similar problems in other areas. Other English bills dealing with civil liability for oil pollution are examined and compared with international law. (Horwitz-Florida)
W72-00289

CONTROL OF ESTUARINE POLLUTION,
For primary bibliographic entry see Field 06E.
W72-00290

SEWER CONSTRUCTION.
For primary bibliographic entry see Field 06E.
W72-00291

A BILL TO AMEND THE FISH AND WILDLIFE COORDINATION ACT IN ORDER TO PROTECT MARINE ENVIRONMENT BY REGULATING THE DUMPING OF WASTES IN THE COASTAL AND OCEAN WATERS OF THE UNITED STATES.
For primary bibliographic entry see Field 06E.
W72-00292

STATE CERTIFICATION OF ACTIVITIES REQUIRING FEDERAL LICENSE OR PERMIT.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 06E.
W72-00293

WATER QUALITY STANDARD CERTIFICATIONS.
Federal Power Commission, Washington, D.C.
For primary bibliographic entry see Field 06E.
W72-00294

NEW JERSEY WATER QUALITY IMPROVEMENT ACT OF 1971.
For primary bibliographic entry see Field 06E.
W72-00298

TERMINALS FOR THE LOADING OR DISCHARGE OF PETROLEUM OR CHEMICAL LIQUIDS OR PRODUCTS FROM VESSELS.

Rules and Regulations, Connecticut Water Resources Commission, secs 25-54cc-1 thru 25-54cc-7, Hartford, Connecticut. 3 p.

Descriptors: *Connecticut, *Oil, *Ships, *Transfer, Oil wastes, Storage tanks, Facilities, Transportation, Harbors, Planning, Design, Construction, Operation and maintenance, Administrative agencies, Legal aspects, Legislation, Water pollution sources, Safety factors, Water pollution control, Regulation.

Each licensed oil terminal shall be so designed, planned, constructed and maintained as to protect the public safety and prevent discharges or spillage of oil into waters of the state. In order to assure public safety and the prevention of spills, each licensed terminal must: (1) submit each year a current drawing of the facilities; (2) file with the commission a copy of its current operating rules, including procedures for cargo transfer to and from vessels; (3) file a plan of action to contain and remove any oils from spills, including a list indicating the type and capacity of available equipment; (4) have available suitable equipment to properly contain and remove any leakage or spillage; (5) file a statement on the methods of handling and disposal of all miscellaneous oil wastes; and (6) file the name and address of the terminal operator. (Gallagher-Florida)
W72-00299

LICENSING OF PRODUCTION AND UTILIZATION FACILITIES--IMPLEMENTATION OF NATIONAL ENVIRONMENTAL POLICY ACT OF 1969.
Atomic Energy Commission, Washington, D.C.

Federal Register, Vol 36, No 175, p 18071-18076 (September 1971). 6 p.

Descriptors: *United States, *Electric power production, *Nuclear powerplants, *Environmental effects, Electric power industry, Nuclear wastes, Thermal pollution, Federal government, Permits, Regulation, Legislation, Legal aspects, Administrative agencies, Administration, Facilities, Water pollution control, Water pollution.

This Atomic Energy Commission revised regulation for licensing proceedings deals with the basic procedures for implementing the National Environmental Policy Act of 1969, including an identification of information required of applicants, the circulation of environmental reports and detailed statements for comment, and the role of the Atomic Safety and Licensing Board in the environmental review process. Its effect will be to make the Commission directly responsible for evaluating the environmental impact, including thermal effects, of nuclear power plants, and for assessing this impact in terms of available alternatives and the need for electric power. Procedures are established for review of licenses to construct and operate specified facilities and licenses for source material, special nuclear material issued during the period from the Act's enactment to the date of this revision. The regulation deals with procedures applicable to pending and future hearings. Specific factors are established for consideration in determining whether to suspend permits and licenses pending environmental review. (Shelnut-Florida)
W72-00300

NATIONAL OIL AND HAZARDOUS SUBSTANCES POLLUTION CONTINGENCY PLAN.
Council on Environmental Quality, Washington, D.C.
For primary bibliographic entry see Field 06E.
W72-00301

CLEAN OCEAN ACT.
For primary bibliographic entry see Field 06E.
W72-00302

NAVIGABLE WATERS: CERTAIN PRACTICES REGULATED.
For primary bibliographic entry see Field 06E.
W72-00303

NORTH CAROLINA POLLUTION ABATEMENT AND INDUSTRIAL FACILITIES FINANCING ACT.
For primary bibliographic entry see Field 06E.
W72-00304

WATER DIST. NO. 105, KING COUNTY V STATE (APPROVAL AND CERTIFICATION FOR SEWER SYSTEM CONSTRUCTION).
For primary bibliographic entry see Field 06E.
W72-00333

PHILLIPS V. ALTMAN (COVENANT NOT TO SUE AS A DEFENSE TO A PUBLIC NUISANCE),
For primary bibliographic entry see Field 06E.
W72-00335

FARMERS CHEMICAL ASS'N V. UNION CAMP CO. (DENIAL OF JURY TRIAL WHEN INJUNCTION SOUGHT TO ABATE POLLUTION).
For primary bibliographic entry see Field 06E.
W72-00343

SCURLOCK OIL CO. V. HARRELL (ACTION FOR DAMAGES TO LAND AND WATER FROM OIL PIPELINE LEAKAGE).
For primary bibliographic entry see Field 06E.
W72-00353

EVALUATION OF DISPERSED POLLUTIONAL LOADS FROM URBAN AREAS,
Oklahoma Univ., Norman. Bureau of Water Resources Research.
For primary bibliographic entry see Field 05B.
W72-00355

GENERAL CRUDE OIL CO. V. AIKEN (GROUNDWATER POLLUTION BY SALINE WATER FROM OIL DRILLING OPERATIONS AS CREATING PERMANENT DAMAGES).

335 S.W.2d 229-235 (Civ. App. Tex 1960).

Descriptors: *Texas, *Water pollution sources, *Saline water, *Drilling, Legal aspects, Judicial decisions, Relative rights, Remedies, Water rights, Damages, State governments, State jurisdiction, Water supply, Pollution abatement, Land tenure, Water law, Water pollution, Water quality, Oil wells, Oil industry, Oil wastes, Water pollution control.

Plaintiff ranchowner sought to recover damages for the permanent decrease in land value from operations of defendant oil company. Defendant was the owner of an oil and gas lease from plaintiff and operated three oil wells on plaintiff's land. Plaintiff contended that salt water was produced from the oil wells and was placed into evaporating tanks which were inadequate to handle the large volume of water. Plaintiff contended that as a result of defendant's negligent operation, plaintiff's fresh water spring and entire groundwater supply was polluted by salt water. The trial court awarded damages to plaintiff for the permanent injury to his land. Defendant appealed claiming that the damages were not permanent in nature and the damages incorrectly included a reduction in the value of the mineral lease. The Court of Civil Appeals of Texas reversed and remanded the case, holding that the instructions concerning the amount of damages incorrectly included the decline in oil production. The court, however, did find ample evidence of permanent damages from salt water intrusion. Injury to land may be permanent in law without being perpetual. (Horwitz-Florida)
W72-00363

HAZARDS OF MERCURY, SPECIAL REPORT TO THE SECRETARY'S PESTICIDE ADVISORY COMMITTEE, DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE.
For primary bibliographic entry see Field 05B.
W72-00374

USE AND ABUSE OF NATURAL WATER SYSTEMS,
Rice Univ., Houston, Tex.
For primary bibliographic entry see Field 05D.
W72-00380

GULF OIL CORP. V. ALEXANDER (POLLUTION OF GROUNDWATER BY SEEPAGE FROM SALT WATER DISPOSAL PITS).
For primary bibliographic entry see Field 06E.
W72-00381

INTERNATIONAL ENVIRONMENTAL PROBLEMS--A TAXONOMY,
Resources for the Future, Inc., Washington, D.C.
For primary bibliographic entry see Field 05C.
W72-00384

ROSS V. FINK (STATUTE PROHIBITING SALT WATER FLOW OVER SURFACE OF LAND INAPPLICABLE TO POLLUTION BY UNDERGROUND WATERS).
For primary bibliographic entry see Field 06E.
W72-00387

COSTS AND EFFECTS OF A WATER QUALITY PROGRAM FOR A SMALL STRIP MINING COMPANY,
West Virginia Univ., Morgantown. Dept. of Economics; and Xavier Univ., Cincinnati, Ohio. Dept. of Economics and Finance.
G. R. Dreese, and H. L. Bryant.
U.S. Army Engineer Institute for Water Resources Report 71-7, August, 1971. 150 p, 3 fig, 19 tab, 12 charts, 1 map, 22 ref, 5 append.

Descriptors: *Standards, *Water law, *Impaired water quality, *Strip mine wastes, *Acid mine water, *Mine drainage, *Strip mines, *Ohio, Elasticity of demand, Marginal costs, Electric power industry, Water supply, Legal aspects.
Identifiers: *Water treatment costs, *Water quality standards, Price leadership, Market conditions, Industry concentration.

To economically analyze the effects of water quality standards, the behaviour of a small strip mining firm in southeastern Ohio was examined. Specific objectives were to measure the quantity and quality of acid mine drainage, measure drainage control costs, estimate the ability of the firm to absorb or pass on these costs, and estimate the impact of alternative drainage control programs. Because the firm is exempt from state water quality controls, it has no pollution control program, and is contributing increasing amounts of acid to streams. In addition, its ability to absorb program costs is limited by market conditions and its own cost curves. It would be competitively disastrous for a small firm with a relatively high cost operation and a perfectly elastic demand curve to undertake any kind of control program. If water quality standards were enforced then large-scale acid control programs would be successful because dominant firms (price leaders) can contractually shift these costs onto the consumers (electric utilities) under conditions of price inelastic demand. Smaller firms would then follow. Also, the trend toward greater industrial concentration will be strengthened by economies of scale in pollution control measures. (Haugh-Wisconsin)
W72-00388

PREVENTION OF STREAM POLLUTION BY SAWDUST; POWERS OF LOCAL GOVERNMENT CONCERNING WATER SUPPLIES.
For primary bibliographic entry see Field 06E.
W72-00389

APPLICATIONS OF PROGRAM BUDGETING TO ENVIRONMENTAL PROBLEMS,
For primary bibliographic entry see Field 06B.
W72-00391

THE VALUATION OF PUBLIC GOODS,
For primary bibliographic entry see Field 06B.
W72-00392

PEOPLE V. CITY OF LOS ANGELES (MUNICIPAL SEWAGE DISPOSAL REGULATION BY THE STATE DEPARTMENT OF HEALTH).
For primary bibliographic entry see Field 06E.
W72-00398

THOMPSON V. WALSH (INJURY TO CATTLE RESULTING FROM STREAM POLLUTION BY OIL LESSEE).
For primary bibliographic entry see Field 06E.
W72-00400

SUNRAY OIL CO. V. BURGE (ACTION AGAINST PETROLEUM PRODUCT MANUFACTURER FOR DAMAGE TO LIVESTOCK FROM DRINKING POISONOUS WATER.
For primary bibliographic entry see Field 06E.
W72-00401

THE METABOLISM OF CITIES,
For primary bibliographic entry see Field 06B.
W72-00403

VALUES IN THE CONTROL OF ENVIRONMENT,
A. Wolman.
In: Water, Health and Society, Indiana University Press. 1969. p 297-304.

Descriptors: *Environment, *Value, *Engineering, *control, *Public health, Management, Standards, Planning.
Identifiers: *Environmental control, *Individual, Change, Modification.

The purpose is to indicate a field for continued environmental control in the public health program. The article further demonstrates the wide range of possibilities for the engineer in such areas of malaria control, housing design, city planning, industrial hygiene and sanitation, and food handling. The engineer should make a careful application of intelligent research, so that the environment will be adjusted to the maximum advantage of the individual. The article suggests that the field of environmental control has suffered in the past from it most avid proponent, the sanitary engineer himself. The era of controlling and understanding the environment is a long way off. However, we have concentrated too much energy on controlling the negative aspects of the environment, such as industrial accidents and yellow fever. Very little has been contributed towards the positive side of controlling the environment, i.e., the maintenance of a higher level of physiological efficiency at all times by the proper adjustment of factors in the environment. No one can question that the individual's adaptation to the world may be improved by changing or modifying his physical environment. (Strachan-Chicago)
W72-00404

MAN AND HIS CHANGING ENVIRONMENT,
A. Wolman.
In: Water, Health and Society, Indiana University Press. 1969. p 267-275. 2 ref.

Descriptors: *Environment, *Public health, *Planning, *Water supply, Water pollution, Epidemiology, Demand, Budgeting.
Identifiers: *Change, *Environmental problems, *Policy making, Disciplines, Food technology.

The world of modern man is characterized by its changing environment. The public health officer must now be concerned and informed about many areas of change within the environment. Such areas include: water supply, water pollution, food technology, and occupational health. All these areas of change are of prime importance to the public health officer, since the effect of these changes is ultimately unknown. Guides for action are discussed. The author concludes that a synthesis of scientific knowledge, epidemiologic verity, public demand, and rare intuition, all controlled by budgetary restraint, is the best choice. Solving the problems of the environment requires the cooperation of all disciplines, since problems of the environment concern the attention of all disciplines. Not one group of people and not one discipline can claim jurisdiction over the problems. However, the task of focusing the varied disciplines on the environment is yet to be done. The public health officer must develop this broad approach to the problems of the environment. (Strachan-Chicago)
W72-00405

TECHNICAL, FINANCIAL, AND ADMINISTRATIVE ASPECTS OF WATER SUPPLY IN THE URBAN ENVIRONMENT IN THE AMERICAS,
For primary bibliographic entry see Field 06B.
W72-00406

MID-CONTINENT PIPELINE CO V CRAUTHERS (RELEASE OF SERVANT TORT-FEASOR).
For primary bibliographic entry see Field 06E.
W72-00413

GLOBE AIRCRAFT CO. V. THOMPSON (DAMAGES FOR ACID POISONING OF CATTLE).
For primary bibliographic entry see Field 06E.
W72-00418

NEW YORK'S WATER QUALITY SURVEILLANCE PROGRAM,
New York State Dept. of Environmental Conservation, Albany.
Donald B. Stevens, and Ronald E. Maylath.
Preprint of paper presented at Water Pollution Control Federation Conference, 44th, Session 2, No 5, October 4, 1971. 9 p.

Descriptors: *Water quality control, *Sampling, *Monitoring, Automatic control, Remote sensing, Aerial photography, Instrumentation, Cost analysis, Waste assimilative capacity.
Identifiers: *Visual observation.

A multi-phase monitoring program designed to: (1) acquire, evaluate and disseminate information on the quality of waters for and from various, local, state, and federal agencies together with educations, commercial, industrial, and individual entities; (2) determine the long term trends and variations of water quality; and (3) provide a rapid intelligence system for the preservation of the waters and the protection of the water users. Manual surveillance, automatic surveillance, aerial surveillance and public surveillance all play a part in the monitoring process. From these surveillance systems, a comprehensive Water Quality Data Library has, with the help of electronic data processing equipment, been assembled. The compiling of all water quality data by one agency, acting as the central repository for New York State will facilitate the fulfillment of the water quality data needs of all the various entities concerned. Careful cross checking of the data will reveal where trouble spots are located, and allow corrective action to be instituted quickly. (Lowry-Texas)
W72-00424

TECHNOLOGY AND MANAGEMENT OF THE ENVIRONMENT.

Oregon State University, Water Resources Research Institute, Seminar WR 014.71, July 1971. 89 p.

Descriptors: *Water resources, *Waste water treatment, Planning, Systems analysis, Social aspects, Aesthetics, Economics, Federal government, State government, Local government, Industries, Population, Legislation, Attitudes, Pacific Northwest U.S.

In an effort to better understand the total environment and the subsystems which comprise the environment, this seminar included not only environmental actions but attitudes and indications of coming policies concerning environmental matters. The dominant theme was one of organization and planning. 4 of the 8 articles published were concerned with organization and planning of some facet of the environment. The remaining articles dealt with particular areas of the environmental interest, mainly wastewater production and management in the Pacific Northwest region of the United States. It was generally concluded that waste control and management must stop being focused on a short-range narrow viewpoint, and become accountable from the long-range system viewpoint if damage to the environment is to be alleviated. (Lowry-Texas) (See also W72-00427 thru W72-00430)
W72-00426

INDUSTRIAL EFFLUENTS OF THE NORTHWEST,
Cornell, Howland, Hayes, Merryfield/Hill, Corvallis, Oreg.
Robert E. Pailthorp.
Oregon State University, Water Resources Research Institute, Seminar WR-014.71, July 1971, p 51-56.

Descriptors: Waste water treatment, *Industrial wastes, *Water reuse, Pacific Northwest US, Pulp and paper industry, Canneries, Lumber, Legislation, Irrigation, Temperature, Color, Toxicity, Turbidity, Hydrogen ion concentration, Monitoring, Water pollution sources.
Identifiers: Tanneries.

Major effluent producing industries of the Northwest region include lumber, wood, and fiber industries, food processing, metals, clothing, and tanneries. Wastes from these operations have the following undesirable impacts: (1) temperature; (2) turbidity; (3) pH changes; (4) sludge beds; (5) color changes; (6) low dissolved oxygen; (7) toxicity; (8) taste and odor; (9) foam, and (10) floating materials. Most treatment work has been concentrated on removals of the floating material, foam, settleable and suspended solids, and BOD; however, interest is now being focused more on color, temperature, and toxic or bio-stimulatory compounds. The need to reduce waste discharges has stimulated investigations in by-product recovery, water re-cycling, dry manufacturing processes, and others. Improved salt removal, nitrogen removal, solids concentration and disposal, and monitoring and testing techniques are still needed. Future demands indicate possible outlawing of certain crops which produce a high proportion of wastes. Some form of governmental control is imminent. (See also W72-00426) (Lowry-Texas)
W72-00427

CATTLE FEEDLOTS AND ALTERNATIVES FOR WASTE MANAGEMENT,
Environmental Protection Agency, Portland, Oreg. Water Quality Office.
C. E. Veirs.
Oregon State University, Water Resources Research Institute, Seminar, WR 014.71, July 1971, p 65-76. 9 ref.

Descriptors: *Livestock wastes, *Water quality control, *Confinement pens, Manure lagoons, Settling basins, Land management, Fertilizers, Storm run-off, Nitrates, Groundwater, Incineration, Waste water treatment, Coliforms, Cattle, Sheep, Hogs, Design criteria, Pacific Northwest.

Daily waste production of domestic animals is 10 times the waste production of the human population of the U.S. Per capita beef consumption has risen 34% from 1950 to 1960, while meat consumption overall has risen 15%. To meet the demand, the number of beef cattle in the U.S. has gone from 85 million head in 1945 to 108 million head in 1965, a 27% increase. Prior to the advent of large feedlots, wastes were returned to the land to aid in feed production, but many feed lots have concentrated so many animals that there is not enough land nearby upon which to spread the wastes. Waste treatment facilities are now becoming necessary to these operations. The most common are oxidation lagoons and ditches, although incineration and composting are simulating considerable interest. Sight selection guidelines, design criteria, and waste management suggestions are presented. The development of new techniques and the utilization of known conservation practices can and should be combined to achieve water quality control as well as soil and water conservation. (See also W72-00426) (Lowry-Texas)
W72-00428

EVALUATION STRATEGIES AND WATER RESOURCE DEVELOPMENT,
California Univ., Riverside.
For primary bibliographic entry see Field 06B.
W72-00429

SUBTLE ASPECTS OF ECOSYSTEM MANAGEMENT,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 06G.
W72-00430

BOATING LITTER AND POLLUTION CONTROL.
For primary bibliographic entry see Field 06E.
W72-00438

WATER QUALITY CRITERIA FOR SPECIFIED RIVER BASINS.
Kansas State Board of Health, Topeka.

Regulations 28-16-11 thru 28-16-26, January 1972. 108 p, 16 map.

Descriptors: *Kansas, *Water quality control, *Standards, *Regulation, Physical properties, Water quality, River basins, Water utilization, Bacteria, Coliforms, Dissolved oxygen, Tempe.ature, Control, Hydrogen ion concentration, Oil wastes, Solid wastes, Turbidity, Taste, Water pollution control, Odor, Color, Industrial wastes, Municipal wastes, Legal aspects.

These regulations provide specific scientific and technical water standards for individual river basins. The specific water quality standards govern: (1) water uses, (2) bacteria count, (3) fecal coliform content, (4) dissolved oxygen levels, (5) water temperature, (6) hydrogen ion potential, (7) oil and grease levels, (8) presence of organic and inorganic solids, (9) turbidity, (10) taste and odor producing substances, and (11) color. Specific provisions control standards for municipal wastes and levels of normal disinfection and seasonal disinfection for municipalities and industries which contribute bacterial loads to rivers and streams. (Gallagher-Florida)
W72-00449

RIVER POLLUTION IN INTERNATIONAL LAW,
A. Lester.
Harvard International Law Club Bulletin, Vol 3, No 2, p 77-116, April 1962. 40 p, 168 ref.

Descriptors: *International commissions, *International law, *Rivers, *Water pollution control, *Legal aspects, Water pollution sources, Water demand, Competing uses, Water supply, Sewage disposal, Hydroelectric power, River basins, Riparian rights, International joint commission, Judicial decisions, Treaties, United States, Governments, Adjudication procedure, Water rights, Damages, Remedies, Water law.

International law needs specific legal norms to govern cases of international river pollution. State responsibility for extraterritorial damage did not emerge in international law until the beginning of the industrial revolution in Europe during the nineteenth century. A denial of liability for river pollution by upper riparian states is based upon the Harmon Doctrine established by the United States in 1895. Discussion of disputes between India and Pakistan and Canada and the United States illustrate the Doctrine's defects. Doctrines creating liability, including territorial integrity and sic utere tuo, are discussed. A theoretical basis for liability could be based upon any of three theories: (1) neighborship or reciprocity between states to agree to minimize extraterritorial damage, (2) abuse of rights combining notions of individual and social

fault, and (3) servitudes established by agreement or prescription. International cases, including the Trail Smelter, the Diversion of Water from the Meuse, and the Lake Lauonx, are discussed to find possible norms to govern the economic use of international rivers. International agreements, particularly the 1909 Boundary Waters Treaty between Canada and the United States, are discussed. The conclusion summarizes the article and suggests other guidelines for formulating legal norms. (Rees-Florida)
W72-00450

ANNUAL PROGRESS REPORT 1969-1970.
Arkansas Pollution Control Commission, Little Rock.

Annual Progress Report 1969-1970, 1971. 33 p, 3 map, 9 tab, 1 chart, 1 append.

Descriptors: *Arkansas, *Pollution abatement, *Water pollution control, *Waste disposal, *Administrative agencies, Water pollution, Air pollution, Industrial wastes, Domestic wastes, Legal aspects, Water quality, Water quality control, On-site investigations, Monitoring, Laboratory tests, Standards, Permits, Construction, Treatment facilities, Grants, Solid wastes, Publications, Regulation.

In the area of water pollution control, this report summarizes events and progress in (1) field investigations and monitoring, (2) laboratory activities, (3) issuance of permits and construction of treatment facilities, (4) the number of grant offers, and (5) issuance of waste disposal permits. In regard to air pollution control, the report analyzes the existing situation, suggests proposals for future action, and lists: (1) the companies which have been issued industrial permits, (2) the firms that have been issued incinerator permits, and (3) air pollution control compliance schedules. Another section of the report evaluates the principal tasks accomplished in the area of solid waste disposal and the activities planned for the coming year. Several examples are provided to illustrate the types of formal actions taken by the commission to achieve compliance with environmental quality standards. The concluding section of the report details the activities of the commission in disseminating pollution control information. (Gallagher-Florida)
W72-00451

LANDOWNER'S RIGHT TO RELIEF AGAINST POLLUTION OF HIS WATER SUPPLY BY INDUSTRIAL OR COMMERCIAL WASTE,
For primary bibliographic entry see Field 06E.
W72-00452

IMPLEMENTATION AND ENFORCEMENT PLAN FOR WATER QUALITY REGULATIONS.
Washington State Department of Ecology, Olympia.

September, 1970. 96 p, 1 map, 3 tab, 1 append.

Descriptors: *Washington, *Water quality control, *Regulation, *Standards, Water pollution control, Waste water treatment, Water quality, Permits, Water policy, Water resources, Legal aspects, Water utilization, Water pollution, Water supply, Water treatment, Waste water disposal, State governments, Administration, Evaluation, Adoption of practices.

Water quality criteria and watercourse classification and use for all of the waters of Washington are herein detailed. Existing water quality is compared with the criteria established through regulation. Waste treatment and control requirements are detailed. A listing of all inadequately treated waste discharges and the improvements required are set forth. Time schedules for the completion of improvements to waste treatment or control facilities are laid down. Soil erosion, agricultural waste water, waste from vessels and marinas, river impoundments, animal feedlots, log storage, dredging and dredging spoils, and storm runoff are the non-point pollution sources discussed and evaluated. Implementation, surveillance, and enforcement programs are presented. (Robinson-Florida)
W72-00453

SAN FRANCISCO BAY-DELTA WATER QUALITY CONTROL PROGRAM: FINAL REPORT.
California Water Resources Control Board, Sacramento.

March 1969. 118 p, 32 fig, 27 tab.

Descriptors: *California, *Environmental sanitation, *Waste water disposal, *Waste water (Pollution), Governments, Legal aspects, Water law, Water pollution, Water quality control, Effluents, Water pollution sources, Water reuse, Waste water treatment, Reclaimed water, Sanitary engineering, Treatment facilities, Municipal wastes, Industrial wastes, Bays, Oceans, Deltas, Outlets, Discharge water, Aquatic environment, Projects.

This is a report on the need for and feasibility of a comprehensive waste collection and disposal system serving the San Francisco Bay-Delta area, as well as other measures for the maintenance of water quality. The report includes detailed descriptions of: (1) the water environment in the Bay-Delta area, (2) the sources of wastewater loads, (3) assimilative capacity of potential receiving waters, and (4) the criteria for the protection of beneficial uses in the area. After describing alternative systems for wastewater management, a regional water quality control system is recommended. The first phase of the recommended three-phase system would involve the exportation of treated wastewaters from the extremities of San Francisco Bay to the more central regions of the Bay. Phase Two would include the construction of a regional wastewater treatment plant discharging into an ocean outfall system. The third phase would consist of two options, one to reclaim the wastewater, the other to dispose of it. The use of a regional governing agency and financing by general obligation bonds is recommended for implementation of the plan. The report concludes with a consideration of the need for control of land- and ocean-derived salinities within the Delta. (Johnson-Florida)
W72-00454

POLLUTION PROBLEMS IN THE PETROLEUM INDUSTRY--CONSTRUCTION OF AND COMPLIANCE WITH FEDERAL AND STATE LAWS,
Mobile Oil Corp., Dallas, Tex.
W. F. Smith.
Institute on Oil and Gas Laws and Taxation, Vol 20, p 87-175, 1969. 89 p, 174 ref, 3 append.

Descriptors: *Water pollution control, *Oil industry, *Legislation, *Pollution abatement, Water pollution, Oil, Water pollution sources, Water quality control, Standards, Regulation, Air pollution, Gases, Municipal wastes, Industrial wastes, Federal government, State governments, Rivers and Harbors Act, Waste disposal, Navigable waters, Treaties, Jurisdiction, Legal aspects.

In the past, legal solutions to environmental problems centered on tort theories. Recent anti-pollution efforts have led to a proliferation of regulation at all levels of government. A summary is made of federal laws dealing with water and air pollution, with particular reference to oil and gas operations. The interplay between federal and state laws is also discussed. The oil industry should make greater efforts to publicize its many efforts to improve water resources. The single greatest source of water pollution is municipal, not industrial, wastes. Early pollution laws are detailed, including the Rivers and Harbors Act, which has been used to prohibit accidental oil refuse discharges into navigable waters. The publicity surrounding several oil spills prompted new legislation and regulations, including international treaties directed toward control of oil pollution on the high seas. Recent federal water pollution legislation attempts a unified approach to pollution abatement. Water quality standards and the problems they have raised are detailed, along with enforcement proceedings, state and federal concurrent jurisdiction, the constitutionality of pollution statutes, and state laws on pollution. A glossary provides definitions of water quality terms. (Smiljanich-Florida)
W72-00455

CASES AND MATERIALS ON ENVIRONMENTAL LAW,
For primary bibliographic entry see Field 06E.
W72-00456

WATER POLLUTION CONTROL PROGRAMS.
Hearings--Subcomm. on Air and Water Pollution--Comm. on Public Works, U. S. Senate, 92d Cong, 1st Sess, February 4, 8, and 9, 1971. 781 p, 22 fig, 120 tab, 147 ref, 10 append.

Descriptors: *Water pollution control, *Administrative agencies, *Legislation, *Regulation, Water Quality Act, Standards, Oil, Federal government, State governments, Water pollution, Water pollution sources, Water pollution effects, Water pollution treatment, Water quality, Water quality control, Pollutants, Pollution abatement, Remedies, Planning, Research and development, Permits, Administrative decisions.

Preliminary oversight hearings by the subcommittee on air and water pollution of the Senate committee on public works began February 4, 1971. Subjects covered were: (1) funding and manpower experience in the Federal program for water pollution control; (2) regulations to be issued by the Environmental Protection Agency governing permits for industrial discharges under the Refuse Act of 1899; (3) regulations to be issued by the Environmental Protection Agency regarding state certification of discharges under section 21 (b) of the Water Quality Act Amendments of 1970; (4) the extension and tightening of water quality standards; and (5) the preparation and promulgation of effluent guidelines. The Administrator of the Environmental Protection Agency testified on the status of numerous projects; the National League of Cities and the National Milk Producers Federation also introduced statements. A lengthy appendix to the Administrator's statement contains reports on: (1) research and development, (2) state legislation and programs, (3) Federal Water Quality Act studies, (4) oil and hazardous materials pollution, (5) monitoring programs, (6) water quality standards, and (7) planning. (Hart-Florida)
W72-00457

PETERSON V. TEXAS CO. (LIABILITY FOR DAMAGES CAUSED BY ESCAPE WASTES FROM OIL LEASE),
For primary bibliographic entry see Field 06E.
W72-00458

CONTROLLING POLLUTION: THE ECONOMICS OF A CLEANER AMERICA,
M. I. Goldman.
Prentice-Hall, Inc., Englewood Cliffs, New Jersey, (1967). 175 p, 2 tab, 7 ref.

Descriptors: *Pollution abatement, *Water pollution sources, *Economies of scale, *Economic aspects, Water pollution control, Water quality control, Waste disposal, Waste treatment, Pollutants, Industrial wastes, Municipal wastes, Legislation, Interstate compacts, Interstate rivers, Treatment plants, Sewage, Federal government, Financing, Standards, Public health, Water policy, Monitoring, Administrative agencies, Aerobic treatment, Water supply, Legal aspects.

A series of articles examines the social costs Americans must expend in order to control present

sources of water and air pollution and to abate future sources. The task ahead to control pollution is explained and solutions are suggested on an intra-and-interstate level. The book is divided into five topics: (1) part one examines both the general nature of the problem and the special problems of the Great Lakes; (2) part two is an economic analysis of the cost of controlling pollution by using several economic indicators, primarily the cost-benefit analysis; (3) current cases are analyzed to demonstrate recent efforts in controlling and abating water pollution in interstate rivers through disposal control and treatment of municipal and industrial wastes, the primary sources of water pollution; (4) part four provides a brief look at Soviet efforts to control water pollution; and (5) excerpts are set forth from the Annual Report of the Council of Economic Advisors, 1966, a policy statement for the abatement of pollution. (See also W72-00460, W72-00462) (Rees-Florida)
W72-00459

TOWN OF BRAGGS V. SLAPE (LIABILITY FOR DAMAGES CAUSED BY MUNICIPAL DISCHARGE OF RAW SEWAGE).
For primary bibliographic entry see Field 06E.
W72-00460

CITY OF BETHANY V. TWIN LAKES GUN CLUB (MEASURING DAMAGES TO PLAINTIFF'S LAKE FROM POLLUTION FROM CITY SEWAGE DISPOSAL PLANT).
For primary bibliographic entry see Field 06E.
W72-00461

WHAT IS POLLUTION,
M. I. Goldman, and R. Shoop.
In: Controlling Pollution: The Economics of a Cleaner America, p 59-70, Prentice Hall Inc., Englewood Cliffs, New Jersey, 1967. 12 p.

Descriptors: *Water pollution sources, *Water pollution effects, *Classification, *Water pollution control, Watercourses (Legal), Organic wastes, Pulp wastes, Industrial wastes, Toxins, Solid wastes, Radioactive wastes, Heated water, Thermal pollution, Bacteria, Effluents, Oxygen demand, Aerobic treatment, Photosynthesis, Algae, Sewage, Municipal wastes, Sewage treatment, Treatment facilities, Legal aspects.

A brief survey is made of the various kinds of air and water pollution, the means of measuring these pollutants, and the methods employed to control pollution. Pollution is a relative concept, as pollution occurs only when impurities rise above a certain specified level. Water pollution can be classified in five aspects: (1) putrescible materials are ordinary domestic and industrial organic wastes; (2) heated effluents that cause thermal pollution; (3) toxins which are not easily broken down by biological means and which are not readily neutralized by watercourses; (4) inert wastes that enter as solids into water but are not involved in chemical reactions; and (5) radioactive substances. The article describes the process of oxygen depletion in waters and the natural and artificial means to restore an oxygen balance. Physical and biological means to measure water pollution are examined, along with the methods employed to treat these various pollutants. The process and effectiveness of primary, secondary, and tertiary sewage treatment are discussed. (See also W72-00459) (Rees-Florida)
W72-00462

PURE OIL V. RENTON (ACTION FOR DAMAGES TO REALTY FROM POLLUTION OF STREAM BY SALINE WATER).
For primary bibliographic entry see Field 06E.
W72-00463

EFFLUENTS AND AFFLUENCE,
J. E. Hazelton.
In: Controlling Pollution: The Economics of a Cleaner America, p 91-99, Prentice Hall, Inc., Englewood Cliffs, New Jersey, 1967. 9 p.

Descriptors: *New England Interstate WPS Compact, *Interstate rivers, *Water pollution control, *Water quality control, *Effluents, Waste disposal, Waste treatment, Municipal wastes, Industrial wastes, Water demand, Water quality, Standards, Classification, Water users, Water policy, Public health, Water supply, Federal government, Financing, Treatment facilities, Zoning, Water utilization, Economic justification.

The zoning approach to water pollution control of the New England Interstate Water Pollution Control Compact is described. This regional authority classifies sections of rivers according to a scale of potential water uses, balancing the cost of treatment and dumping restrictions against the benefits various kinds of water use bring to a community. Historically, pollution was a public health menace. Today pollution is seen as preventing many uses of interstate waters. The control of pollution is related to the functions the water is to serve. A classification and setting of standards is essential to a control program. The present status of pollution control in New England is detailed, with emphasis upon the classification system employed, the construction and operation of treatment plants, and a survey of present stream conditions. A look is made of prospects for the future. The Federal Water Pollution Control Act and its amendments, which institutionalize the federal role in water pollution control, are examined. Broadening state responsibilities and expanding necessary controls to increase land and water utilization are necessary to adequately control water pollution. (See also W72-00459) (Rees-Florida)
W72-00464

WOOD OIL CO. V. VENDICOTT (DAMAGE TO REALTY AND PERSONALTY FROM OIL WELLS).
For primary bibliographic entry see Field 06E.
W72-00465

NORTH V. EVANS (DAMAGE TO LAND FROM SALT WATER DISCHARGED FROM OIL WELLS).
For primary bibliographic entry see Field 06E.
W72-00466

THE ANNUAL REPORT OF THE COUNCIL OF ECONOMIC ADVISORS, 1966.
In: Controlling Pollution: The Economics of a Cleaner America, p 171-175, Prentice Hall, Inc., Englewood Cliffs, New Jersey, 1967. 5 p.

Descriptors: *Pollution abatement, *Water pollution control, *Water quality control, *Water policy, Water pollution sources, Wastes, Waste disposal, Waste treatment, Industrial wastes, Radioactive wastes, Oil wastes, Municipal wastes, Public health, Rivers and Harbors Act, Water Quality Act, Legislation, Cities, State governments, Federal government, Treatment plants, Financing, Environmental sanitation.
Identifiers: *Federal Water Pollution Control Act.

A broad overview of the federal government's role, present and future, in the abatement of pollution is provided. State and federal governments have acted in several ways to control or prohibit the dumping of untreated wastes through: (1) regulation of waste disposal to improve water quality; (2) construction of treatment plants municipally owned to collect and treat waterborne wastes; and (3) financial incentives and assistance for the construction of treatment plants. The enforcement of water quality standards is examined through legislation such as the Rivers and Harbors Act, the Federal Water Pollution Control Act, and their subsequent amendments. Enforcement is made through: (1) the collection of evidence that the pollution endangers the health or welfare of specific persons; (2) a conference of the control agencies leading to a schedule of remedial measures; and (3) public hearings and court action to effect the remedial measures. A construction is made of the difficulties in each of these areas and the need for federal financial assistance for pollution abatement facilities and programs. (See also W72-00459) (Rees-Florida)
W72-00467

TRANSCRIPTS OF THE SPEECHES, NATIONAL CONFERENCE ON ENVIRONMENTAL LAW.
California Univ., Berkeley.
For primary bibliographic entry see Field 06E.
W72-00468

THE LEGAL FUTURE: NEW THEORIES OF ENVIRONMENTAL PROTECTION,
California Univ., Berkeley.
For primary bibliographic entry see Field 06E.
W72-00469

ECONOMIC AND TECHNICAL PROBLEMS IN ENVIRONMENTAL LITIGATION.
California Univ., Berkeley.
For primary bibliographic entry see Field 06E.
W72-00470

THE FUNCTIONS AND FEATURES OF PRIVATE LITIGATION IN THE GROWTH OF ENVIRONMENTAL LAW,
California Univ., Berkeley.
For primary bibliographic entry see Field 06E.
W72-00471

THE LEGAL PROFESSION'S LEADERSHIP IN REBUILDING ENVIRONMENTAL QUALITY,
California Univ., Berkeley.
For primary bibliographic entry see Field 06E.
W72-00472

ENVIRONMENTAL LAWYER IN THE LION'S MOUTH: LITIGATION BEFORE AND AGAINST ADMINISTRATIVE AGENCIES,
California Univ., Berkeley.
For primary bibliographic entry see Field 06E.
W72-00473

DEFENSES AND THE ROLE OF INDUSTRY LAWYERS,
California Univ., Berkeley.
For primary bibliographic entry see Field 06E.
W72-00474

THE 1971 WATER POLLUTION STUDY FOR THE STATE OF TENNESSEE,
For primary bibliographic entry see Field 06E.
W72-00475

TENNESSEE WATER QUALITY CONTROL ACT OF 1971 WITH COMMENTARY,
For primary bibliographic entry see Field 06E.
W72-00476

ALABAMA (ANALYSIS AND COMPARISON WITH TENNESSEE WATER POLLUTION CONTROL LAW),
For primary bibliographic entry see Field 06E.
W72-00477

ALASKA (ANALYSIS AND COMPARISON WITH TENNESSEE WATER LAW),
For primary bibliographic entry see Field 06E.
W72-00478

ARIZONA (ANALYSIS AND COMPARISON WITH TENNESSEE WATER POLLUTION CONTROL LAW),
For primary bibliographic entry see Field 06E.
W72-00479

ARKANSAS (ANALYSIS AND COMPARISON WITH TENNESSEE WATER POLLUTION LAW),
For primary bibliographic entry see Field 06E.
W72-00480

CALIFORNIA (ANALYSIS AND COMPARISON WITH TENNESSEE WATER POLLUTION LAW),
For primary bibliographic entry see Field 06E.
W72-00481

COLORADO (ANALYSIS AND COMPARISON WITH TENNESSEE WATER POLLUTION LAW),
For primary bibliographic entry see Field 06E.
W72-00482

FLORIDA (ANALYSIS AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE WATER POLLUTION LAW),
For primary bibliographic entry see Field 06E.
W72-00483

HAWAII (ANALYSIS AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE WATER POLLUTION LAW),
For primary bibliographic entry see Field 06E.
W72-00484

INDIANA (ANALYSIS AND COMPARISON WITH TENNESSEE WATER POLLUTION LAW),
For primary bibliographic entry see Field 06E.
W72-00485

IOWA (ANALYSIS AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE WATER POLLUTION LAW),
For primary bibliographic entry see Field 06E.
W72-00486

KANSAS (ANALYSIS AND COMPARISON OF KANSAS AND TENNESSEE WATER POLLUTION LAW),
For primary bibliographic entry see Field 06E.
W72-00487

KENTUCKY (ANALYSIS AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE WATER POLLUTION LAW),
For primary bibliographic entry see Field 06E.
W72-00488

LOUISIANA (ANALYSIS OF STATE'S WATER POLLUTION LAW AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE LAW),
For primary bibliographic entry see Field 06E.
W72-00489

MAINE (ANALYSIS OF STATE'S WATER POLLUTION LAW AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE LAW),
For primary bibliographic entry see Field 06E.
W72-00490

MARYLAND (ANALYSIS OF MARYLAND WATER POLLUTION LAW AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE LAW),
For primary bibliographic entry see Field 06E.
W72-00491

MASSACHUSETTS (ANALYSIS OF STATE WATER POLLUTION LAW AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE LAW),
For primary bibliographic entry see Field 06E.
W72-00492

MICHIGAN (ANALYSIS OF WATER POLLUTION LAW AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE LAW),
For primary bibliographic entry see Field 06E.
W72-00493

MINNESOTA (ANALYSIS OF STATE'S WATER POLLUTION LAW AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE LAW),
For primary bibliographic entry see Field 06E.
W72-00494

MISSISSIPPI (ANALYSIS OF STATE WATER POLLUTION LAW AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE LAW),
For primary bibliographic entry see Field 06E.
W72-00495

MONTANA (ANALYSIS OF STATE WATER POLLUTION LAW AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE LAW),
For primary bibliographic entry see Field 06E.
W72-00496

NEBRASKA (ANALYSIS OF STATE'S WATER POLLUTION LAW AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE LAW),
For primary bibliographic entry see Field 06E.
W72-00497

NEVADA (ANALYSIS OF STATE WATER POLLUTION LAW AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE LAW),
For primary bibliographic entry see Field 06E.
W72-00498

NEW HAMPSHIRE (ANALYSIS OF STATE WATER POLLUTION LAW AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE LAW),
For primary bibliographic entry see Field 06E.
W72-00499

NEW JERSEY (ANALYSIS OF STATE'S WATER POLLUTION LAW AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE LAW),
For primary bibliographic entry see Field 06E.
W72-00500

NEW MEXICO (ANALYSIS OF STATE WATER POLLUTION LAW AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE LAW),
For primary bibliographic entry see Field 06E.
W72-00501

NEW YORK (ANALYSIS OF STATE'S WATER POLLUTION LAW AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE LAW),
For primary bibliographic entry see Field 06E.
W72-00502

NORTH DAKOTA (ANALYSIS OF STATE'S WATER POLLUTION LAW AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE LAW),
For primary bibliographic entry see Field 06E.
W72-00503

OHIO (ANALYSIS OF STATE'S WATER POLLUTION LAW AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE LAW),
For primary bibliographic entry see Field 06E.
W72-00504

OKLAHOMA (ANALYSIS OF STATE WATER POLLUTION LAW AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE LAW),
For primary bibliographic entry see Field 06E.
W72-00505

OREGON (ANALYSIS OF STATE WATER POLLUTION LAW AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE LAW),
For primary bibliographic entry see Field 06E.
W72-00506

PENNSYLVANIA (ANALYSIS OF STATE WATER POLLUTION LAW AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE LAW),
For primary bibliographic entry see Field 06E.
W72-00507

RHODE ISLAND (ANALYSIS OF STATE WATER POLLUTION LAW AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE LAW),
For primary bibliographic entry see Field 06E.
W72-00508

SOUTH CAROLINA (ANALYSIS OF STATE WATER POLLUTION LAW AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE LAW),
For primary bibliographic entry see Field 06E.
W72-00509

SOUTH DAKOTA (ANALYSIS OF STATE'S WATER POLLUTION LAW AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE LAW),
For primary bibliographic entry see Field 06E.
W72-00510

UTAH (ANALYSIS OF STATE WATER POLLUTION LAW AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE LAW),
For primary bibliographic entry see Field 06E.
W72-00511

VERMONT (ANALYSIS OF STATE WATER POLLUTION LAW AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE LAW),
For primary bibliographic entry see Field 06E.
W72-00512

VIRGINIA (ANALYSIS OF STATE WATER POLLUTION LAW AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE LAW),
For primary bibliographic entry see Field 06E.
W72-00513

WASHINGTON (ANALYSIS OF STATE WATER POLLUTION LAW AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE LAW),
For primary bibliographic entry see Field 06E.
W72-00514

WEST VIRGINIA (ANALYSIS OF STATE WATER POLLUTION LAW AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE LAW),
For primary bibliographic entry see Field 06E.
W72-00515

WISCONSIN (ANALYSIS OF STATE WATER POLLUTION LAW AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE LAW),
For primary bibliographic entry see Field 06E.
W72-00516

WYOMING (ANALYSIS OF STATE WATER POLLUTION LAW AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE LAW),
For primary bibliographic entry see Field 06E.
W72-00517

FEDERAL WATER POLLUTION CONTROL ACT,
For primary bibliographic entry see Field 06E.
W72-00518

SUPPLEMENT TO FEDERAL PROGRAM SECTIONS,
For primary bibliographic entry see Field 06E.
W72-00519

ANNUAL USER SURVEILLANCE FEE,
For primary bibliographic entry see Field 06E.
W72-00520

ENVIRONMENTAL HEALTH AND ECOLOGY: OLD CONCEPTS WITH NEW MEANING FOR MANS SURVIVAL,
W. F. McCulloch.
J Amer Vet Med Ass. 157 (11): 1970. 1432-1438.
Copyright 1971, Biological Abstracts, Inc.
Identifiers: Agriculture, Ecology, Education, Environmental, Health, Man, Mans, New, Old, Parasitism, Pig, Pollution, Rabbit, Survival.
W72-00535

SAFE USE OF PESTICIDES ON LIVESTOCK,
J. L. Hourrigan.
J Amer Vet Med Ass. 157 (11): 1970. 1818-1827.
Copyright 1971, Biological Abstracts, Inc.
Identifiers: Cattle, Environmental, Guidelines, Human, Livestock, Pesticides, Pollution, Poultry, Registration, Sheep, Swine.
W72-00538

MAGNOLIA PETROLEUM CO. V. MCGEELEY (PAYMENT FOR VOID EASEMENTS AS OFFSET TO RECOVERY FOR POLLUTION DAMAGES).
For primary bibliographic entry see Field 06E.
W72-00543

KINNISCHTZKE V. CITY OF GLEN ULLIN (LIABILITY OF MUNICIPALITY DISCHARGING INADEQUATELY TREATED SEWAGE).
For primary bibliographic entry see Field 06E.
W72-00544

06. WATER RESOURCES PLANNING

6A. Techniques of Planning

MULTI-TIME PERIOD, FACILITIES LOCATION PROBLEMS: A HEURISTIC ALGORITHM WITH APPLICATIONS TO WASTEWATER TREATMENT SYSTEMS,
Massuchusetts Univ., Amherst. Water Resources Research Center.
For primary bibliographic entry see Field 05D.
W72-00048

WAVES GENERATED BY PISTON-TYPE WAVEMAKER,
Army Coastal Engineering Research Center, Washington, D.C.
For primary bibliographic entry see Field 08B.
W72-00351

WYOMING (ANALYSIS OF STATE WATER POLLUTION LAW AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE LAW),
For primary bibliographic entry see Field 06E.
W72-00517

6B. Evaluation Process

WATER SUPPLY FOR THE FUTURE IN SOUTHERN NEVADA.
Nevada State Div. of Water Resources, Carson City.
For primary bibliographic entry see Field 06D.
W72-00181

APPRAISAL AND MANAGEMENT OF WATER RESOURCES IN SOUTH AFRICA,
University of the Witwatersrand, Johannesburg (South Africa). Hydrological Research Unit.
D. C. Midgley.
South African Journal of Science, Vol 67, No 3, p 210-217, March 1971. 5 fig, 1 tab, 4 ref.

Descriptors: *Water resources, *Water utilization, *Economic efficiency, *Planning, *Water allocation (Policy), Semiarid climate, Watershed management, Reservoir storage, Impounded waters, Economic feasibility, Runoff, Evaporation, Surface waters.
Identifiers: *Hydro-economic analysis, *South Africa.

A comprehensive reappraisal of South African surface water resources was recently completed and a wealth of information was obtained. However, it is asserted that the simple maps and averages emerging from such a study may give a misleading picture because water resources recur in stochastic fashion and availability depends not only on storage provided but also management efficiency. To cope with increasing demands within a surface water supply system, several courses are open: (1) increase of storage provision, (2) restriction of supplies, (3) reclamation for reuse within the system, (4) reduction of losses, and (5) linkage of the system with supplies from an external source. Because of the variable character of stream flow and increase of evaporation losses with increased storage area, the rate of improvement of yield with increasing storage diminishes rapidly with decreasing frequency of supply failure. It then follows that large quantities of low guarantee water can be made available at high efficiency (low system losses) and at relatively low cost, while the comparatively small quantities of high guarantee water that can be made available are costly and associated with high system losses. Water development programs must be economically evaluated in this light. The 2 types of water are distinctly different and can be merged only at considerable expense and water wastage. In the semiarid interior plateau, high guarantee water supplies cannot be greatly enhanced by increasing storage; water should be provided only for increasing low guarantee purposes. High guarantee water should be supplied from importation, recycling of reclaimed water, periodically recharged groundwater stores or from other measures dictated primarily by appropriate economic considerations. (Casey-Arizona)
W72-00186

EXPANSION OF SANTA BARBARA HARBOR, CALIFORNIA. HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
Charles W. Brasfield, and James W. Ball.
Available from the National Technical Information Service as AD-723 939, $3.00 in paper copy, $0.95 in microfiche.

Descriptors: *Breakwaters, *Hydraulic models, *Harbors, Storms, Ocean waves, *Channel improvement, Test procedures.
Identifiers: Harbor models, California, Santa Barbara Harbor.

A 1:20-scale model reproducing one-half of the channel section through a low-water weir was used to test eight plans of channel improvement. The tests were conducted with a drop height of 5.5 ft, and discharges up to 10,000 cfs were observed. Flow conditions and slope protection downstream from the weir to control the flanking problem were found to be satisfactory with channel improvement plans 6 and 8. Riprap with an average weight of 33 lb was used in slope protection in both plans. A model headwater-tailwater rating curve was obtained. A second 1:20-scale section model was constructed in a 2.5-ft-wide glass flume for more generalized riprap tests in the vicinity of the structure. Several drop structure plans were observed to develop an effective, economical drop structure. Of primary concern were development of some of the dimensions of various elements of the structure and determination of riprap requirements in the vicinity of the structure. Limiting tailwater curves for 220- and 325-lb riprap are furnished as a guide in riprap selection at drop structures with drop heights of from 5 to 10 ft. Suggestions as to the use of these curves also are included. A basin length of 20 ft is considered to be adequate at projects where the jet will ride through at unit discharges exceeding about 10 cfs. It is recommended that the entire 20 ft be protected by riprap of the same size, whether 200- or 325-lb stone. A riprap plan which provides additional protection to the structure is presented in Appendix A. This plan was not considered warranted for initial construction because of increased cost. However, at weirs where maintenance is required it is planned that this work be performed so as to approach the riprap configuration proposed in Appendix A.
W72-00349

EVALUATION OF NATURAL RIVER ENVIRONMENTS: PHASE II,
State Univ. of New York, Binghamton. Research Foundation.
M. Morisawa.
Available from the National Technical Information Service as PB-203 747, $3.00 in paper copy, $0.95 in microfiche. Final report, 1971. 114 p, 51 fig, 15 tab, 10 plates, 38 ref, append.

Descriptors: *Planning, *Inventories, *Surveys, *Wild rivers, Environment, Hydrology, Aesthetics, Recreation, Michigan, Wyoming, New Jersey, Colorado, Arkansas, Missouri, *Evaluation, Rivers, River basins, Flow.
Identifiers: Wind River (Wyo), South Fork White River (Colo), Buffalo River (Ark), Jacks Fork (Mo), Manistee River (Mich), Mullica River (NJ).

Six rivers, representing a variety of natural environments were studied to apply and refine methods of inventorying and evaluating various aspects of the watersheds. Criteria and procedures were set up to inventory and categorize the natural and hydrologic environments; to identify and evaluate the scenic beauty and cultural values of the watersheds and to estimate their potential for recreational and personal resources. The methodology and criteria set forth should be applicable to planning of water resources for management or conservation purposes relating to recreational potential, aesthetic qualities, water use and promotion of physical stability in river systems. (See also W70-07327)
W72-00357

A MODEL FOR THE ECONOMIC EVALUATION OF WATER QUALITY IN IRRIGATION,
Hebrew Univ., Jerusalem (Israel); and Volcani Inst. of Agricultural Research, Bet-Dagan, (Israel).
For primary bibliographic entry see Field 03F.
W72-00382

THE GREAT LAKES CONTAINER DILEMMA,
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
For primary bibliographic entry see Field 06C.
W72-00385

MULTISTAGE MARGINAL COST MODEL OF INVESTMENT-PRICING DECISIONS: APPLI-

CATION TO URBAN WATER SUPPLY TREATMENT FACILITIES,
Cornell Univ., Ithaca, N.Y. Dept. of City and Regional Planning.
For primary bibliographic entry see Field 06C.
W72-00386

COSTS AND EFFECTS OF A WATER QUALITY PROGRAM FOR A SMALL STRIP MINING COMPANY,
West Virginia Univ., Morgantown. Dept. of Economics; and Xavier Univ., Cincinnati, Ohio. Dept. of Economics and Finance.
For primary bibliographic entry see Field 05G.
W72-00388

ENVIRONMENTAL POLICY AND MANAGEMENT,
H. Barnett.
In: Social Sciences and the Environment, Conference on the Present and Potential Contribution of the Social Sciences, January 31-February 2, 1967. University of Colorado Press, p 219-229. 3 ref.

Descriptors: *Environment, *Management, *Benefits, *Costs, *Decision making, Planning.
Identifiers: *Environmental policy, *Social benefit/social cost, *Policy making, *Interdisciplinary communication, Environmental problems, Social sciences, Physical sciences, Systems, Environmental quality.

This is the summary lecture from the Conference on the Present and Potential Contribution of the Social Sciences to Research and Policy Formulation in the Quality of the Physical Environment at the University of Colorado in 1967. The author concludes that the major problem of the Conference has been one of interdisciplinary communication, partly a result of diverse basic concepts at the foundation of the various disciplines involved. He states a number of positions concerning environmental problems from the perspective of either a biologist or other physical scientist and then reacts to the positions stated as either an economist or social scientist. Some of the approaches which are discussed are: a preference for 'more natural' ecological systems, observation of environmental damage, population growth, materialism, economic growth, individualism, laissez-faire, private property, and obligations to future generations. The author concludes that a system of social benefits and social costs should guide the public decision making process. Conflicting public objectives and diverse interests, such as political, business, regional and others, make the management of environmental policy difficult. However, the policy making should not be left to the judgment of only scientists. Social benefit/social cost calculation involves many intangibles, subjective attitudes, intergeneration judgments, and many values, but it provides the opportunity for the gathering of all relevant data, argument between interested groups, and decision making by representatives of the public. (Strachan-Chicago)
W72-00390

APPLICATIONS OF PROGRAM BUDGETING TO ENVIRONMENTAL PROBLEMS,
J. Haldi.
In: Social Sciences and the Environment, Conference on the Present and Potential Contribution of the Social Sciences, January 31-February 2, 1967. University of Colorado Press, p 195-210. 4 fig, 7 ref.

Descriptors: *Budgeting, *Environment, *Planning, Institutional aspects, *Analysis, *Cost-benefit analysis, Decision making, Benefits.
Identifiers: *Program budgeting, *Planning-Programming-Budgeting (PPB), *Cost-effective analysis, *Environmental problems, Objectives.

The Planning-Programming-Budgeting (PPB) system is discussed by first giving an overview of the system and they by applying it to environmental problems. PPB conceives of budgeting by programs rather than by object classes, i.e., personnel, procurement, travel, etc. It has two basic components: (1) Definition of a program structure and maintenance of a multi-year Program and Financial Plan, and (2) Analysis, evaluation, review, and decision making on major program issues. When applying PPB to environmental problems, definition of objectives is an extremely important procedure. Too frequently the analysis needed for such definition is non-existent. The author concludes that a system of comparative cost-benefit analysis, such as that provided by PPB, could provide the kind of analysis that is needed to make the best kind of judgments in decision making. Comparative cost-benefit analysis, or cost-effective analysis, would: (1) compare programs that aim at similar ends, (2) would give a rank of effectiveness to each program, and (3) would compare different mixes of programs. Such a system would lead to tremendous improvements in environmental programs. (Strachan-Chicago)
W72-00391

THE VALUATION OF PUBLIC GOODS,
P. Davidson.
In: Social Sciences and the Environment, Conference on the Present and Potential Contribution of the Social Sciences, January 31-February 2, 1967. University of Colorado Press, p 125-154. 3 fig, 1 tab, 49 ref.

Descriptors: *Value, *Environment, *Cost-benefit analysis, *Costs, *Analysis, *Benefits, Decision making, Pollutants, Air pollution, Water pollution.
Identifiers: *Valuation, *Public goods, *Public investment, *Environmental quality problems, Policy making, Polluters, Pollution.

Public investment in relation to environmental quality problems is discussed. It is difficult to formulate guidelines for public investment. Decisions of policy are made on the basis of available information and the political structures which are involved. The basic problem of such policy decisions is to weigh the benefit to the individual against the benefit to the greatest number of people. In the case of clean air or clean water, the dumping of pollutants is less costly to the polluters than to the others who must live with the resulting pollution. The cost may be internalized by a variable tax on the polluters or a rule may be imposed to forbid pollution. With public goods externalities, no individual cost incentive program nor any simple rule will lead to an optimal system of control. Cost-benefit analysis can be used to define beneficiaries and types of benefits, and to place these in juxtaposition to the supply prices of various projects. Sometimes the net benefit function cannot be defined in any rigorous fashion, but the maximization of social benefits is the desirable goal of most cost-benefit analysis. Informed value judgments are of the utmost importance within the system of cost-benefit analysis. (Strachan-Chicago)
W72-00392

A RETURN TO THE COAST,
Center for the Environment and Man.
For primary bibliographic entry see Field 02L.
W72-00393

NOURISHING PUBLIC PARTICIPATION,
National Waterways Conference.
H. N. Cook.
Water Spectrum, Vol 3, No 3, p 7-11, Fall 1971.

Descriptors: *Water resources, *Planning, *Decision making, *Governments, *Communication, Engineering, Economics.
Identifiers: *Conference of Federal and State Water Officials, *Water resources planning, *Public participation, *Citizens, Water problems, Planners, Multi-disciplined.

This article reports the discussion and conclusions of a three day Conference of Federal and State Water Officials, held June 8-10, 1971, in Des Moines, Iowa. The Conference was jointly sponsored by the U.S. Water Resources Council and the Interstate Conference on Water Problems. The theme of the Conference was the consideration of aspects of public participation in governmental decision making. The Conference concluded that productive water resource planning must involve the citizenry in the initial stages of the planning process. In this way, conflicts between the planner and the citizen will be brought into the open, and solutions will be more available to any differences which they might have with each other. Planners, and it was generally agreed that they know their business, will have to become better communicators with the public, dispelling half-truths and fully presenting the alternatives and implications of each plan. Communication between the parties should be maintained after planning is completed, allowing for changing public needs and preferences. Until recently, planners were mainly engineers and economists who were involved only with construction techniques and economic feasibility. However, planners are now, by necessity, multi-disciplined. (Strachan-Chicago)
W72-00394

THE EVOLUTION OF A FUNDING POLICY,
Department of the Army, Washington, D.C.
A. Dola.
Water Spectrum, Vol 3, No 3, p 1-6, Fall 1971. 2 fig, 1 map, 2 photo.

Descriptors: *Governments, *Management, *Institutional aspects, *Water resources development, Environment, *Decision making, *Planning.
Identifiers: *Funding policy, *Management control, *Program reform, Policy, Executive, Legislative, Appalachia Report.

Two basic problems confront the executive and legislative branches of the Federal government in evolving a funding policy for the Nation's water resources program. (1) The problem of management control is one of assuring that a program is responsive to top level decisions. Effective management control requires definition of a select number of policy decisions which can be immediately implemented through and by all levels of an agency. (2) The problem of program reform involves making public programs responsive to emerging needs of national priority. Program reform changes have come from State and local officials working with Federal agency representatives, and they should not be considered the sole responsibility if the President and of the Congress. Certain alternatives suggest themselves in the modification of water resources authorization and appropriation processes to accommodate stronger management control and more program reform. (1) To conceive of the authorization process as aiming at the elimination of projects which produce adverse effects, whether they be social, economic, or environmental. (2) To conceive of the authorization process as one in which the priority of all projects, authorized and unauthorized, would be established. The appropriation decision would remain a one-year decision with projects selected for initiation of construction in the budget year from among those projects which had been accorded priority over five years in the authorization process. Implementation of the second alternative will represent the most fundamental change. These arguments the applied to the preparation of the Appalachia Report of the Secretary of the Army. (Strachan-Chicago)
W72-00395

EFFECTS OF RESERVOIR OPERATING POLICY ON RECREATION BENEFITS,
Virginia Polytechnic Inst. and State Univ., Blacksburg.
For primary bibliographic entry see Field 04A.
W72-00399

THE METABOLISM OF CITIES,
A. Wolman.
In: Water, Health and Society, Indiana University Press. 1969. p 276-296. 2 map, 7 chart.

Descriptors: *Cities, *Water resources, *Water supply, *Water pollution, *Water pollution control, *Air pollution, Management, Administration, Deterioration, Urbanization, *Public health, Diseases.
Identifiers: *Metabolic problems, Industrialization.

The metabolic requirements of a city are defined as all the materials and commodities needed to sustain a city's inhabitants at home, at work, and at play. Three metabolic problems are discussed and their solutions are evaluated. These problems have become more acute as cities have grown larger and their solutions reside in the hands of local administrators. The three problems are: provision of an adequate water supply, water pollution, and air pollution. In the area of water supply, the United States has successfully prevented waterborne and water-associated diseases, and has provided water for comfortable living almost all the time. Prospects for the future are equally good since our supply of water is not running out and since we are capable of managing our water resources carefully. In the areas of water and air pollution, our success has been only partial. Scientific data points undeniably to the need for curbing water pollution. However, it is difficult to assert that air pollution is associated with long-term deterioration of the human organism. Rapid urbanization and industrialization have made the control of water and air pollution a harder problem than it has been in the past. Public pressure for the control of air pollution is beginning to affect the production of more detailed scientific research in this area of concern. (Strachan-Chicago)
W72-00403

VALUES IN THE CONTROL OF ENVIRONMENT,
For primary bibliographic entry see Field 05G.
W72-00404

MAN AND HIS CHANGING ENVIRONMENT,
For primary bibliographic entry see Field 05G.
W72-00405

TECHNICAL, FINANCIAL, AND ADMINISTRATIVE ASPECTS OF WATER SUPPLY IN THE URBAN ENVIRONMENT IN THE AMERICAS,
A. Wolman.
In: Water, Health and Society, Indiana University Press. 1969. p 234-263. 2 fig, 14 tab, 1 ref.

Descriptors: *Water supply, *Technology, *Financing, *Administration, *Environment, Leadership, Management, Public health, Cities.
Identifiers: *Latin America, *Water facilities.

The public health officer must work to extend water facilities to individuals, in order to provide water for the thirsty, for cleanliness, for industry, for housing facilities, and for tourism. At the present rate of development (in 1959), water will be made available to only 75% of the population of Latin America over the next 50-100 years. It is not possible to await all the theoretical requisites of a water supply system to be developed. The problem of water supply must be solved now. Sufficient understanding of technologic skills, improved administrative structure, and new devices for financing exist at present, and they can be effectively employed to carry out a militant program of water supply development and management. A combined effort on the part of the Ministries of Health, of Public Works, and of Finance is needed to approach and solve the problem of water supply. This presumes a re-organization of the basic orientation of all health organizations. Leadership must be provided to educate officials in the administrative, technologic, and financial features; and in the national and international banking units for the responsible execution of the projects. (Strachan-Chicago)
W72-00406

WATER-ECONOMICS AND POLITICS,
A. Wolman.
In: Water, Health and Society, Indiana University Press. 1969. p 171-178. 8 ref.

Descriptors: *Water policy, *Economics, *Water resources development, *Planning, *Decision making, Institutional aspects.
Identifiers: *Politics, *Policy making, Scientist-technologist.

The role of the water resources development planner in the decision making process is discussed. The water resources development planner collects and organizes data, and tries to apply his data to achieve better means of using water to enhance health, safety, and the well-being of society. He works through the government and private enterprise to make policy. His system presupposes a predictability of the actions and behavior of political leaders. The historical record shows that major developments in water resources development planning have been episodic in nature, fragmentary in approach, and multiple, and often conflicting, in policies. The process for decision making has become more complex and sophisticated, and whether it is more effective as a result is to be doubted. The role of the professional scientist-technologist in policy making must be to provide the evidence for the illumination of choices, for the clarification of alternatives, and for the evolution of better standards of evaluation. Decision makers ultimately respond to logic and cohesive argument. (Strachan-Chicago)
W72-00407

EVALUATION STRATEGIES AND WATER RESOURCE DEVELOPMENT,
California Univ., Riverside.
Ralph C. D'Arge.
Oregon State University, Water Resources Research Institute, Seminar WR 014.71, July 1971, p 77-89. 3 fig.

Descriptors: *Water resources development, *Planning, *Linear programming, Social aspects, Legislation, Federal government, State government, Local government, Social impact, Aesthetics, Decision making, Economics.

A planning methodology for water resources development was conceptualized, consisting of 4 distinct components. The first component is a set of objectives in a hierarchical ordering where the ordering is derived by postulating national objectives or goals and then, through a process of logical subordination, defining the domains of these national objectives. Logical subordination yields increasing numbers of subordinates or sub-objectives which at some point may yield measureable quantities, the second component. These entities, unemployment, migration rate, BOD discharge rates, define in quantitative terms the changing state of the system. Linkage within and between the national objectives are not subject to quantification, but qualitative properties such as the signs can be determined. The planning system then is envisioned to couple a qualitative system of objectives to a quantitative system of measureable subordinates. The subordinates or social indicators can presumably be linked to water resource planning actions, the third component, through cost-benefit, input-output, materials balance or other tools. The fourth component is the feed back from water resources planning to the national hierarchy, completing the planning circuit. (See also W72-00426) (Lowry-Texas)
W72-00429

CONTROLLING POLLUTION: THE ECONOMICS OF A CLEANER AMERICA,
For primary bibliographic entry see Field 05G.
W72-00459

EFFLUENTS AND AFFLUENCE,
For primary bibliographic entry see Field 05G.
W72-00464

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

AMENITIES RIGHTS--PARALLELS TO POLLUTION TAXES,
Naval War College, Newport, R. I.
For primary bibliographic entry see Field 05G.
W72-00192

SECTION 169: AMORTIZATION OF POLLUTION CONTROL FACILITIES.
For primary bibliographic entry see Field 05G.
W72-00218

THE GREAT LAKES CONTAINER DILEMMA,
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
E. Schenker, and M. Bunamo.
In: Transportation Research Forum Papers/1970, New Orleans, Louisiana, p 327-336. 7 tab, 12 ref.

Descriptors: *St. Lawrence Seaway, *Great Lakes, *Investment, *Transportation, *Economic impact, Income, Ships.
Identifiers: *Containers, *Container facilities, Cargo ports, Cargo diversion.

Lake ports face an immediate dilemma: unless they undertake a coordinated investment program in container facilities to retain their general cargo traffic, significant diversions of container traffic will occur, resulting in a substantial loss of port-related income for the region. Direct and indirect income losses could exceed $100,000,000. Lake ports could avoid these losses by pursuing one or more of the following three alternatives: (1) more extensively utilize Montreal or Quebec City load center's specialized container facilities, (2) provide for a fuller utilization of the Seaway and its existing facilities by, say, constructing specialized container-handling facilities or remodeling existing berths for limited container operations, (3) construct two modern fully-integrated container facilities, one at the southern end of Lake Michigan to serve Chicago and Milwaukee, the other on Lake Erie to serve eastern Lake ports. The first two alternatives represent short-run plans designated to reduce the flow of container cargo diversion; the third alternative is a long-run solution, linking improved and expanded container operations with certain necessary improvements of the entire Seaway system. Several tables provide data on the existing and expected containership registry and on the anticipated impact of containerization on Lake ports. (Settle-Wisconsin)
W72-00385

MULTISTAGE MARGINAL COST MODEL OF INVESTMENT-PRICING DECISIONS: APPLICATION TO URBAN WATER SUPPLY TREATMENT FACILITIES,
Cornell Univ., Ithaca, N.Y. Dept. of City and Regional Planning.
C. Riordan.
Water Resources Research, Vol 7, No 3, p 463-478, June, 1971. 9 fig, 2 tab, 18 ref.

Descriptors: *Water supply, *Cities, *Investment, *Average costs, *Marginal costs, *Mathematical models, Dynamic programming, Water demand, Technology, Pricing, Construction costs, Treatment facilities.
Identifiers: *City water supply, *Investment-pricing decision, *Model assumptions, Production costs, Plant capacity.

An established general investment-pricing model was applied to choosing the timing and sizes of additions to capacity in urban water supply systems. To replace the presently used arbitrary systems of average cost pricing, an optimal investment-pricing

decision was developed which judges the potential real value of the general model. Hypothetical cost and demand curves for water were incorporated into the model which was then solved under varying assumptions regarding technology and the costs of production, demand, policy, and initial conditions. The most egregious differences between model assumptions and reality are discussed with an eye to eliminating them through further research. The lack of empirical (demand and short-run cost) data inhibits the implementation of the general model in the water supply area but the results do imply that the present investment-pricing policies of the industry may be as much as 10-20% inefficient relative to those dictated by the multistage marginal cost pricing model. (Haugh-Wisconsin)
W72-00386

THE MONEY GAP - CAN STATES FILL IT,
Utah State Univ., Logan.
D. H. Hoggan.
Water Spectrum, Vol 3, No 3, p 38-44, Fall 1971. 3 photo.

Descriptors: *Costs, *Institutional aspects, *State governments, *Cost sharing, *Cost allocation, *Financing, *Budgeting, Water, Federal government, Local governments, Jurisdiction.
Identifiers: *Money gap, *Funding, Water development.

Because of the competition for Federal funds in the area of water development, State and local governments are feeling the pressure to pay part of project costs. The major source of funds for State and local governments are bond proceeds, tax revenues, and Federal financial aid. Public debt limitations, such as voter or legislative approval, interest rate ceilings, and limits on repayment contracts present major obstacles in financing water development projects on the part of the States. The use of bond issues, special water development funds, water-use fees, and increased taxation or taxation of the beneficiaries are some of the ways in which these obstacles can be overcome and money can be found within the structure and jurisdiction of State and local governments to fund further projects. The Federal Government and State Governments can share in costs despite the delays which often occur in implementing the plans and obvious differences in budgetary procedures. States can strengthen their own positions by developing sustained long-range funding arrangements. (Strachan-Chicago)
W72-00396

6D. Water Demand

THE FOREST ENVIRONMENT--PROBLEMS AND PROMISES,
Oregon State Univ., Corvallis. Dept. of Forest Engineering.
George M. Jemison.
Water Resources Research Institute Seminar, WR 014.71, July 1971, p 23-32.

Descriptors: *Forest management, *Land use, Recreation, Lumber, Wildlife habitats, Land management, Parks, Forests, Clear cutting, Pulp and paper industry, Wood wastes.

Timbered lands are decreasng in the amount of approximately one million acres per year. Concurrently, the public is demanding more recreational facilities on the one hand, and more wood and wood products on the other. The annual demand for soft wood sawtimber is expected to exceed the supply by 40% over the next 7 years. Environmentalists are pressuring the government and the lodging industry to use all timbered lands for the recreational needs of the public. However, recent legislation has established the fact that lands suited primarily for timber production shall be preserved for that purpose and for no other. In the future professional forestland managers will be required to survey the problem through a unified view of the many intricate subproblems involved. The concept of multiple-use has recently been developed, and must be made to work. To this end, forestry research is being tailored to provide the manager with the knowledge that will give him a range of choices. New technology in the logging industry will also play an important part in reducing waste materials and environmental impact. The underlying theme however, must remain one mainly of consideration of all interests involved in an effort to achieve maximum benefit. (Lowry-Texas)
W72-00010

WATER SUPPLY FOR THE FUTURE IN SOUTHERN NEVADA.
Nevada State Div. of Water Resources, Carson City.

Water for Nevada, Special Water Planning Report No 3, 96 p, January 1971. 5 fig, 8 tab, 108 ref.

Descriptors: *Nevada, *Arid lands, *Water demand, *Water supply, *Planning, Economic feasibility, Water resources development, Population, Social aspects, Groundwater, Diversion, Water utilization, Water users, Water requirements, Water quality, Desalination, Cost-benefit analysis, Nonstructural alternatives, Water conveyance.

Population projections for the Las Vegas Metropolitan Subarea range from 1.1 - 1.3 million by 2020, while projected water requirements will exceed supply by 28 - 39%. Here potential supplementary water sources are analyzed. On the basis of availability for export to Las Vegas of groundwater equivalent to storage in the upper 100 ft of saturated material, studies were made of 9 subareas nearby. Of 5 with available water, only Virgin Valley did not have enough to supply Las Vegas' needs through 2020. Estimates were made of capital costs and per acre unit costs for delivery for high- and low-population projections. Of supplemental sources outside Nevada, estimates were made of unit cost production and distribution from the Snake-Colorado Project and desalination in Los Angeles. Alternatives to expensive conveyance facilities to Las Vegas are considered. Of these, reduction in consumption seems the most feasible. A 100% estimated increase in rates would reduce the possibility of shortages. Recommendations include a continuing water conservation educational program, a tri-state compact with Utah and Arizona over rights to the Virgin River, formulation of a joint southwestern water plan, work with other states to reduce degradation of the Colorado River, studies on the water resources of any groundwater basin appearing to warrant development, and wide dissemination of this report so that all possible views concerning water shortage alleviation may be received. It is pointed out that no future water problem presents itself if projected population growth fails to occur. (Casey-Arizona)
W72-00181

SATISFYING WATER NEEDS IN SOUTHERN CALIFORNIA,
California State Dept. of Water Resources, Los Angeles.
J. M. Coe.
Proc Amer Soc Civ Eng, J Irrig Drain Div, Vol 97, No IR2, p 233-247, June 1971. 15 p, 3 fig, 2 tab, 10 ref, append.

Descriptors: Desalination, Desalination plants, Groundwater, Weather modification, *Planning, Irrigation, Reclamation, *Water resources, Safe yield, *Water consumption, Underground storage, Water quality, Costs, Water supply, Water demand, Water management (Applied), Water reuse, *Population growth, Agriculture.
Identifiers: Southern California, California Water Plan, Los Angeles Region, Calif.

To economically and effectively satisfy water reiuirements in southern California in the year 2020, water planners must predict future water demands and the availability of local and imported supplies, and must develop more information with respect to waste water reclamation and desalting. Alternative management objectives of water production and use and results of recent studies of urban per capita water use are discussed. The existing water supplies are identified, and possible changes in quantity and quality are noted. Concepts and criteria in water resources planning are enumerated. Alternative methods of meeting the supplemental water demands of southern California in 2020 are identified, and the advantages and disadvantages of each are examined. (USBR)
W72-00340

INTERBASIN TRANSFERS: DO WE NEED THEM,
Colorado Univ., Denver.
C. W. Howe.
Water Resources Bulletin, Vol 7, No 4, p 670-675, August 1971. 7 ref.

Descriptors: *Inter-basin transfers, *Water demand, *Water supply, Agriculture, Water management (Applied).
Identifiers: *Population dispersion.

Three main issues are discussed: the demands for additional water stemming from population dispersion; supply alternatives to large-scale interbasin transfers; and the displacement of agriculture from nonprofit regions. It is concluded that population dispersion is unlikely to increase aggregate water demands; that large additional supplies are available from other sources at lesser costs; and that a very likely consequence of large-scale transfers will be the displacement of agriculture in other parts of the country. (Strachan-Chicago)
W72-00402

THE METABOLISM OF CITIES,
For primary bibliographic entry see Field 06B.
W72-00403

6E. Water Law and Institutions

HALL-JONES OIL CO. V CORPORATION COMMISSION (DENIAL OF PERMIT TO DISPOSE OF SALINE WATER).

485 P.2d 744-746 (Okla. 1971).

Descriptors: *Oklahoma, *Administrative agencies, *Permits, *Brine disposal, Saline water, Oil wells, Oil wastes, Oil-water interfaces, Water pollution, Water pollution sources, Water pollution control, Water quality, Water quality control, Groundwater, Saline water intrusion, Subsurface waters, Encroachment, Corrosion, Chemical degradation, Well casings, Administrative decisions, State governments, Legal aspects, Judicial decisions.

Plaintiff oil well owner applied to defendant commission for permission to dispose of salt water by injecting it into annulus between the well's production casing and its urface casing. Although no protests to the application were filed, and no evidence other than plaintiff's was introduced at hearing, the application was denied, and plaintiff prosecuted this appeal. Defendant had specifically found that the salt water might corrode the surface casing, and thereby enter and pollute the fresh water strata lying over the production casing's top. Plaintiff contended that defendant's order was unsupported by substantial evidence. The Oklahoma Supreme Court noted that plaintiff's evidence at hearing had not refuted the possibility of salt water entering the fresh water strata through corroded holes in the surface casing. Hence the court held that defendant's finding in that respect justified denial of the permit. (Hart-Florida)
W72-00006

MODEL LAW TO IMPROVE DAM SAFETY,
USCOLD Committee on Model Legislation for State Safety of Dams, New York.
A. R. Golze.
Civ Eng, Vol 41, No 3, p 53-56, Mar, 1971. 4 p, 3 fig.

Descriptors: *Dams, *Safety, *Inspection, *Supervision, Dam failure, Dam design, Dam construction, Reservoirs, Reservoir operation, Laws, Operation and maintenance, Disasters, State governments, Maintenance, Responsibilities.
Identifiers: USCOLD (Acronym), USCOLD Model Law, Authority.

With worldwide water resource development calling for new dams and reservoirs, frequently on uplands above centers of population, full attention to safe design and construction, intelligent operation, and adequate maintenance of all water-impounding structures is imperative. Public safety is a fundamental and basic responsibility of legislators, administrators, and engineers everywhere. After the Baldwin Hills disaster in California in 1963, the U.S. Commission on Large Dams (USCOLD) undertook a survey of practices and regulations controlling design and construction of dams in the U.S. Results of the survey disclosed a lack of adequate supervision in most states. USCOLD appointed a committee to formulate a model law for state supervision of safety of dams and reservoirs. Using existing California laws as a base, the USCOLD Model Law of 1970 was prepared with the expectation that changes would be made by each state in enacting legislation to meet constitutional and legal requirements. Federal dams were excluded from the provisions of the model law because surveillance of these dams provides an added measure of security. Basic principles, State responsibilities and authority, safety procedures, and operation and maintenance of dams and reservoirs are discussed. (USBR)
W72-00073

PATTERNS OF POLITICS IN WATER RESOURCES DEVELOPMENT,
H. Ingram.
Natur Resour J, Vol 11, No 1, p 102-118, Jan, 1971. 17 p, 28 ref.

Descriptors: *Water resources development, *Political science, Models, *Political aspects, Water resources, Policies, Public opinion, Benefit-cost analysis, Water law, Agricultural economics, *Water policy, Legal aspects, Conservation, Environmental effects, Bibliographies.
Identifiers: Public affairs.

While economists and engineers have fairly explicit criteria for judging water projects as economically justifiable and technically feasible, political scientists have yet to provide comparable insite into the process by which water development becomes politically viable. The basic intent of this paper is to develop a model of the political rationality of water policy, a frame of reference quite different from economics or engineering that entails looking at things in political terms, as the activist seeking to influence public policy must see them. A political activist cannot simply make judgments, he must concern himself with constructing support for his decisions. The model discussed represents the pattern of politics in water resource development, mapping the way in which water issues are perceived onto the risks and rewards confronted by activists in making decisions. It links activists who have a stake in water policy to the particular arena where political rationality, or the extent of support for a proposal, is tested. Policymaking in our political system requires that proposals be consented to or legitimized through established procedures in institutions having authority. (USBR)
W72-00075

POLLUTION OF WATERS OF STATE.

Indiana Stat. Ann. secs. 68-517 thru 68-534 (1961).

Descriptors: *Indiana, *Administrative agencies, *Water pollution control, *Pollution abatement, Water pollution, Water pollution treatment, State governments, Regulation, Legislation, Legal aspects, Standards, Treatment facilities, Administrative decisions, Ecology, Cities, Financing, Government finance, Taxes, Local government.
Identifiers: *Administrative procedure.

The seven-member Indiana stream pollution control board has jurisdiction to control and prevent pollution of state waters by any substance deleterious to public health, ecology, or industry. The board may sue to enforce any laws or orders relating to pollution. The board may issue pollution abatement orders. The board's agents may enter private property to make investigations and inspections relating to pollution. Furthermore, the board may establish water quality standards and regulate waste discharges. It is unlawful to violate the water quality standards thus established. When the board determines that pollution exists, it gives notice and serves an abatement order on the polluter by mail; thereafter a report on the status of abatement must be filed with the board. Hearing may be provided upon request, and the abatement facility plans must be approved by the board. The board's order may be enforced in a civil action with a jury. Municipalities are authorized to issue bonds to finance abatement facilities. Failure to comply with the board's final order is a misdemeanor punishable by fine or imprisonment. When good faith compliance is shown, the board may extend the time for complying with its order. (Hart-Florida)
W72-00095

UNITED STATES V NORTHWEST PAPER CO. (STANDING TO BRING QUI TAM ACTION UNDER REFUSE ACT OF 1899).

327 F Supp 87-95 (D Minn 1971).

Descriptors: *Rivers and Harbors Act, *Adjudication procedure, *Water pollution control, *Federal government, Water pollution, Water quality, Water quality control, Pollution abatement, Legislation, Legal aspects, Judicial decisions, Waste disposal, Industry, Industrial wastes, Waste water (Pollution).
Identifiers: *Qui tam actions.

Plaintiff citizen brought a qui tam action in behalf of the United States against defendant corporations for violation of the Refuse Act of 1899, section 411 of the Rivers and Harbors Act. Defendants moved to dismiss for lack of standing. The Minnesota Environmental Control Citizens Association (MECCA) filed amicus curiae briefs on the standing issue. Plaintiff asserted that section 411, which authorized an informer to recover one-half of the criminal fine paid by a polluter violating the Refuse Act, authorized qui tam suits. The Federal District Court, however, determined that qui tam actions arose only from an affirmative, unambiguous statutory authorization, which was not present in the Refuse Act. In fact, it was observed that the Act directed the Department of Justice to prosecute section 411 violations. Hence, the court held that the Refuse Act did not authorize qui tam actions, and therefore that plaintiff had no standing. (Hart-Florida)
W72-00121

ENQUIST V QUAKER OATS CO. (STANDING TO BRING QUI TAM ACTION UNDER REFUSE ACT OF 1899, AND TO SEEK INJUNCTION).

327 F Supp 347-349 (D Neb 1971).

Descriptors: *Rivers and Harbors Act, *Adjudication procedure, *Water pollution control, *Federal government, Water pollution, Water quality, Water quality control, Water pollution sources, Pollution abatement, Legislation, Legal aspects, Judicial decisions, Waste disposal, Industrial wastes, Rivers.
Identifiers: *Qui tam actions.

Plaintiff citizen brought a qui tam action against defendant corporation for violation of the Rivers and Harbors Act and the Water Quality Improvement Act of 1970. Defendant moved to dismiss for lack of standing. Plaintiff based his complaint on section 411 of the Rivers and Harbors Act, which provides that informers may receive one-half the criminal fine levied on one convicted of violating the Act. The federal district court, however, observed that the Act directed enforcement by the Department of Justice and therefore held that plaintiff could not maintain the action in his own name. The court also rejected plaintiffs plea for injunctive relief on the same basis; plaintiff could show no particular injury to himself as distinguished from the public at large. Therefore, defendant's motion to dismiss was granted. (Hart-Florida)
W72-00140

ZARROW V HUGHES (LIABILITY FOR OIL AND SALT WATER OVERFLOW FROM OIL WELL).

282 P.2d 215-218 (Okla 1955).

Descriptors: *Water pollution sources, *Stock water, *Oklahoma, *Oil wastes, Overflow, Damages, Water pollution, Cattle, Seepage, Impaired water quality, Pollutants, Oil, Oily water, Oil wells, Natural streams, Remedies, Legislation, Judicial decisions, Legal aspects, Oil fields, Oil industry, Salinity.

Plaintiff cattle rancher sued defendant oil company for damages resulting from the pollution of stock water by the overflow of oil and salt water from defendant's oil well. Such pollution prevented plaintiff from putting his cattle to pasture. Plaintiff contended that defendant wrongfully neglected to prevent the overflow. Defendant generally denied plaintiff's contentions. The Supreme Court of Oklahoma held that an Oklahoma statute, which provides that no inflammable product or salt water from any oil well shall be permitted to flow over land, placed a duty upon the owner and operator of such a well to prevent such substances from escaping to the premises of others. The court ruled that the statute was penal in nature, and that defendant's violation thereof endered it liable for all damages caused thereby. The judgment for plaintiff was affirmed. (Shelnut-Florida)
W72-00146

JACKSON V. CLARK (NECESSITY OF CAUSAL RELATIONSHIP BETWEEN POLLUTION DAMAGE AND THE CONDUCT OF A DEFENDANT).
264 P.2d 727-730 (Okla 1953).

Descriptors: *Oklahoma, *Water pollution effects, *Oil wastes, *Adjudication procedure, Salinity, Judicial decisions, Legal aspects, Water law, Water pollution, Water pollution sources, remedies, damages, Water wells, Saline water, Wastes, Oil, Natural gas, Oil fields, Oil industry, Oily water, Oil wells.

Plaintiff landowner sued defendant oil lessee for damages to realty resulting from oil, waste, refuse, and salt water from defendant's oil and gas wells. A ditch ran from defendant's salt water disposal well and continued into plaintiff's property. Plaintiff alleged that defendant was guilty of gross negligence in permitting deleterious substances to flow through this ditch and onto plaintiff's land. Plaintiff alleged defendant's conduct had resulted in the loss of pecan trees and the contamination of two water wells. Defendant maintained that plaintiff had established no causal connection between his injuries and the acts complained of. The jury rendered a verdict for plaintiff. The Supreme Court of

Oklahoma held that in order to recover for damages to realty from pollution there must be a causal connection between the acts complained of and the injury received. The court reversed and remanded for a new trial because of plaintiff's failure to introduce competent evidence of a causal relationship. (Robinson-Florida)
W72-00159

MAGNOLIA PIPELINE CO V. STATE (ACTIONS OF A THIRD PARTY AS DEFENSE TO POLLUTION PROSECUTION).
243 P.2d 369-384 (Crim App Okla 1952).

Descriptors: *Oklahoma, *Pipelines, *Water pollution sources, *Oily water, Water pollution control, Oil, Judicial decisions, Water law, Legislation, Water pollution, Water pollution effects, Water quality, Water quality control, Oil industry, Oil wells, Pipes, Relative rights, Adjudication procedure.

Defendant pipe line company was prosecuted for the contamination of a public stream in violation of a statute. Defendant's crude oil pipe line had been cut when a steel rod line, belonging to another, fell from its supports onto defendant's pipe line. Defendant maintained that he was entitled to an instruction on his defense that the pollution resulted from the act of a third party. The jury returned a verdict of guilty. The Criminal Court of Appeals of Oklahoma reversed and held that a failure to give an affirmative instruction embracing the defense that the pollution rested on a third party was reversible error. The court ruled that under the Oklahoma pollution statute no intent or negligence is necessary and the acts of a third person constitute a defense. The conviction was reversed. (Robinson-Florida)
W72-00160

CITY OF BETHANY V. MUNICIPAL SECURITIES CO. (APPEALING PARTY LIMITED TO DEFENSES RAISED AT TRIAL).
274 P.2d 363-369 (Okla 1953).

Descriptors: *Oklahoma, *Sewage disposal, *Silts, *Eutrophication, Judicial decisions, Water law, Legal aspects, Damages, Sewage effluents, Water pollution sources, Sanitary engineering, Sewage treatment, Water pollution effects, Fishkill, Water pollution control, Water pollution, Adjudication procedure.

Plaintiff company sought to recover damages from defendant city for pollution of a lake. Defendant's sewage disposal plant was insufficient to properly treat the sewage of the population served by the plant, and its effluent was discharged into a stream which ran into plaintiff's lake. Plaintiff contended that defendant's discharges had caused an accumulation of silt which had to be removed. Defendant contended that it did not pollute plaintiff's lake and that if it had, it should only be liable for the removal of silt deposited within the statutory period of limitations. The Supreme Court of Oklahoma held that a judgment based on a jury verdict should not be set aside if reasonably supported by the evidence and that a litigant will not be permitted to present his case on appeal on a different theory than that on which the suit was tried. The court ruled that the evidence was sufficient to show the pollution and contamination of plaintiff's lake and pointed out that defendant had not contended at trial that it should be liable only for silt accumulated during the statutory period. Judgment for plaintiff was affirmed. (Johnson-Florida)
W72-00167

PAKISTAN'S WATER PROBLEMS AND THE LAW OF INTERNATIONAL RIVERS,
Ministry of Foreign Affairs Karachi (Pakistan).
M. A. Samad.
Pakistan Horizon, Vol 23, No 3, p 265-274, 1970. 2 ref.

Descriptors: *International waters, *International law, *Water law, *Riparian rights, *River basins, Alteration of flow, Irrigation programs, Prior appropriation, Legal aspects, Dams, Reasonable use, Relative rights, Remedies, Water sources, Water utilization.
Identifiers: *India, Pakistan.

The Ganges River arises in the Himalayas, flows through India, forms an international boundary for several miles and then turns east to meet the Brahmaputra almost in the center of East Pakistan. A Ganges Barrage was planned by the Pakistan government which would provide water through gravity movement of 4.25 million acres, in a critically grain-short region. A dispute arose between Pakistan and India when the Indian government developed a plan to construct a dam at Farakka, about 11 miles upstream from the point where the river enters East Pakistan. The dam would divert 40,000-46,000 cusecs of Ganges water. Since there is a dry season flow of only 54,000-56,000 cusecs, Pakistan would effectively be deprived of all river water. Citing various international riparian agreements and portions of the Helsinki Rules of the International Law Association, the author argues that certain well-established principles should be applied to international riparian disputes. These essentially include: (1) the principle of equitable apportionment of international waters between 'Basin States' such that each State is entitled to a reasonable and equitable share in the beneficial use of the water; (2) each State's sovereignty in its use of an international river is subject to certain limitations; (3) if the utilization of an international river results in damage to a coriparian state, prior consent must be obtained, and if damage occurs, the aggrieved state is entitled to indemnification. (Casey-Arizona)
W72-00179

SOME ASPECTS OF RESOURCE USE IN RELATION TO THE ORANGE RIVER PROJECT,
Cape Town Univ. (South Africa). Dept. of Botany.
For primary bibliographic entry see Field 03F.
W72-00185

RESOLUTION ESTABLISHING AMENDED CRITERIA OF STREAM WATER QUALITY FOR VARIOUS USES ADOPTED BY THE BOARD ON APRIL 14, 1970.
For primary bibliographic entry see Field 05G.
W72-00188

STREAM PRESERVATION IN ARKANSAS.
For primary bibliographic entry see Field 02E.
W72-00190

CONTRACT REGARDING AN INTERIM SUPPLEMENT TO TANKER LIABILITY FOR OIL POLLUTION.
For primary bibliographic entry see Field 05G.
W72-00191

AMENITIES RIGHTS--PARALLELS TO POLLUTION TAXES,
Naval War College, Newport, R. I.
For primary bibliographic entry see Field 05G.
W72-00192

RADIOACTIVE WASTE AND THE ENVIRONMENT,
George Washington Univ., Washington, D. C. National Law Center.
For primary bibliographic entry see Field 05B.
W72-00193

RULES AND REGULATIONS--WATER QUALITY STANDARDS.
Iowa Water Pollution Control Commission, Des Moines.
For primary bibliographic entry see Field 05G.
W72-00194

WATER QUALITY STANDARDS (INTERSTATE WATERS, ILLINOIS RIVER AND LOWER SECTION OF DES PLAINES RIVER),
Illinois Sanitary Water Board, Springfield.

Rules and Regulations SWB-8, March 1968. 16 p, 1 map, 3 tab.

Descriptors: *Illinoise, *Rivers, *Water pollution control, *Standards, *Water quality control, Regulation, Pollution abatement, Administration, Administrative agencies, Permits, State governments, State jurisdiction, Federal government, Water quality, Public health, Water pollution sources, Legal aspects, Waste disposal, Treatment facilities, Inspection, Water utilization, Adoption of practices.
Identifiers: *Des Plaines River, *Illinois River.

This promulgation prescirbes water quality standards which are necessary for the designated public use of the controlled waters. Violation of these standards shall be considered indicative of a polluted condition subject to abatement. These standards are applicable to the Illinois River main stream and the Des Plaines River downstream from the confluence with the main stream. The regulated waters are divided into sectors. Water uses are assigned to each sector. Minimum criteria covering all waters are established along with specific standards for each of the following uses: public water supply and food processing, aquatic life, recreation, and industrial water supply. The standards include specifications concerning: dissolved oxygen content, pH values water temperature, toxic substances, chemical concentrations, bacteria, water color, odor, and floating solids and debris. Implementation and enforcement plans are set forth. The goal of this promulgation is to protect and upgrade water quality. To achieve this goal, any wastes amenable to control must receive the best practicable treatment prior to discharge. The present status of municipal waste treatment facilities is depicted in two tables. (Horwitz-Florida)
W72-00195

WATER QUALITY STANDARDS (INTERSTATE WATERS, LAKE MICHIGAN AND LITTLE CALUMET RIVER, GRAND CALUMET RIVER AND WOLF LAKE).
Illinois Sanitary Water Board, Springfield.
For primary bibliographic entry see Field 05G.
W72-00196

RULES AND REGULATIONS ESTABLISHING MINIMUM STANDARDS RELATING TO LOCATION, DESIGN, CONSTRUCTION, AND MAINTENANCE OF INDIVIDUAL SEWAGE DISPOSAL SYSTEMS.
Rhode Island State Dept., of Health, Providence.
For primary bibliographic entry see Field 05E.
W72-00197

INTERSTATE AND INTRASTATE WATER TEMPERATURE STANDARDS FOR PROTECTION OF FISH AND AQUATIC LIFE.
Michigan Water Resources Commission, Lansing. Dept. of Natural Resources.
For primary bibliographic entry see Field 05G.
W72-00198

SUMMARY OF WATER QUALITY STANDARDS FOR DESIGNATED USE AREAS IN MICHIGAN INTERSTATE WATERS.
Michigan Water Resources Commission, Lansing. Dept. of Natural Resources.
For primary bibliographic entry see Field 05G.
W72-00199

HOW YOUR MICHIGAN WATER RESOURCES COMMISSION PROTECTS MICHIGAN'S LAKES AND STREAMS.
Michigan Water Resources Commission, Lansing. Dept. of Natural Resources.

5 p.

Descriptors: *Michigan, *Water pollution control, *Administrative agencies, *State jurisdiction, Water pollution sources, Legislation, Regulation, Standards, State governments, Legal aspects, Administration, Water quality control, Water resources development, Permits, Treatment facilities, Investigations, Monitoring, Sewage, Fishkill, Environmental sanitation, Public health, Public benefits, Great Lakes, Administrative decisions.

The Water Resources Commission, in the Department of Natural Resources, is the water pollution control agency of Michigan. Its duty is to protect and conserve the water resources of Michigan and to control the pollution of any water of the state and the Great Lakes. Before the Commission may act, it must determine, on the basis of facts and proof, that pollution exists or may occur. Pollution is defined as any waste discharge which is or may become injurious to such considerations as public health, public water supply, recreation, and riparian property. If the Commission finds that pollution is occurring, it issues abatement orders and may seek court enforcement. Pollution is detected by the following systems: (1) investigation of complaints, (2) surveillance, and (3) MONITORING. The Commission protects Michigan's waters by: (1) encouraging voluntary pollution controls, (2) ISSUING ABATEMENT ORDERS, (3) issuing restrictions on new uses of water, (4) implementing water quality standards, (5) licensing liquid industrial waste haulers, and (6) certifying industrial waste treatment plant operators. Citizens can help the Commission by reporting fish kills, oil slicks, unusually colored waters, or the presence of raw sewage. (Johnson-Florida)
W72-00200

MICHIGAN'S INTRASTATE WATER QUALITY STANDARDS--INTRASTATE USE DESIGNATION AREAS.
Michigan Water Resources Commission, Lansing. Dept. of Natural Resources.
For primary bibliographic entry see Field 05G.
W72-00201

AIR AND WATER POLLUTION CONTROL--PERMITS.

Florida Laws 1971, ch. 71-203, Florida Session Law Service, p 810-313, 1971. 4 p.

Descriptors: *Administrative agencies, *Water pollution control, *Florida, *Permits, Water pollution, Air pollution, Administration, Sewage disposal, Water quality control, Classification, Facilities, Legislation, Legal aspects, State governments, Adoption of practices.

This act requires stationary installations which may pollute the air or water to secure permits from the Department of Air and Water Pollution Control. The Department shall provide procedures for issuance, denial, and revocation of permits. A permit will not become a vested right in the permittee, and may be revoked if the Department finds that the permittee: (1) submitted false information in his application; (2) violated the law, department regulations, or permit conditions; (3) failed to submit operational reports; or (4) refused lawful inspection. No revocation, however, will become effective until a hearing is held. Additionally, the act requires a person presently discharging or intending to discharge waste into state waters to obtain an operational permit. Before applying, he must file a report of such discharges with the Department. If it finds that the discharges will reduce the quality of the receiving waters below the established classification, it shall refuse to issue a permit. Any person, however, who has been denied or does not qualify for an operation permit, may apply for a temporary operational permit. Criteria for the issuance of temporary permits are enumerated. (Shelnut-Florida)
W72-00202

FLORIDA LITTER LAW OF 1971.
Florida Laws 1971, ch. 71-239, Florida Session Law Service, p 968-970, 1971. 3 p.

Descriptors: *Florida, *Wastes, *Waste disposal, *Water pollution control, Water pollution, Legislation, Legal aspects, State governments, Local governments, Administrative agencies, Recreation wastes, Domestic wastes, Environmental sanitation, Water pollution sources, Pollutants, Environment, Environmental effects, Public rights, Remedies.

Recognizing mankind's right to clean water and unspoiled lands, and the problem of littering, the Florida Legislature enacted this statute, which defines litter as any garbage, rubbish, cans, bottles, containers, trash, refuse, or papers. Definitions of person and law enforcement officer are also furnished. The law provides that it is unlawful to discard litter on: (1) public highways or lands, (2) any public waters, or (3) any private property without consent. Violation of these provisions is a misdemeanor punishable by fine and/or imprisonment. Law enforcement officers of local governments, specialized state agencies, or state government are obligated to enforce the law. Conflicting laws are expressly repealed. (Hart-Florida)
W72-00203

ENVIRONMENTAL PROTECTION ACT.
Florida Laws 1971, ch. 71-343, Florida Session Law Service, p 1123-1124, 1971. 2 p.

Descriptors: *Florida, *Adjudication procedure, *Legal aspects, *Pollution abatement, Legislation, Environment, Conservation, Environmental sanitation, Administration, Administrative agencies, Administrative decisions, Local governments, State governments, Cities, Water pollution, Air pollution, Permits, Water quality, Water quality control, Water pollution control.

The Florida Environmental Protection Act of 1971 authorizes the department of legal affairs, any political subdivision or municipality of the state, or any state citizen to maintain an action for injunctive relief against: (1) any agency charged with enforcing environmental protection laws, to compel the agency to enforce the laws; or (2) any person, natural or corporate, to enjoin violation of environmental protection laws. The department of legal affairs may intervene to represent state interests. A condition precedent to suit is the filing of a copy of the complaint with the agency charged with enforcement of the environmental protection law. Further, the agency must be allowed 30 days to take appropriate action. Failure to comply with the condition precedent will not bar an action for a temporary injunction. The court may add as a party defendant the agency charged with enforcement. No action may be maintained, however, if the person charged with violation of an environmental protection is in compliance with a valid permit. Bond may be required of any plaintiff, and comprehensive relief may be granted. Additionally, the same parties are given standing to intervene in administrative proceedings affecting the environment. (Hart-Florida)
W72-00204

INTERSTATE ENVIRONMENTAL COMPACT.
Florida Laws 1971, ch. 71-79, Florida Session Law Service p 203-206, 1971. 4 p.

Descriptors: *Florida, *Interstate compacts, *Legal aspects, *Environment, Air pollution, Water pollution, Water pollution control, Water quality, Water quality control, State governments, Pollution abatement, Legal aspects, Legislation, Interstate commissions.

The Florida Legislature has enacted an Interstate Environmental Compact, signifying approval and ratification in advance. The purpose of the compact is to establish state participation in national environmental protection programs and promote intergovernmental cooperation for environmental protection. Any state and the territories of Puerto Rico and the Virgin Islands, but not the District of Columbia, may join the compact. Signatories are authorized to cooperate among themselves and with the federal government for protection of interstate environments. Supplementary agreements between any two signatories are authorized. Special supplementary agreements with the District of Columbia and foreign nations are authorized. Future multi-state commissions and interstate compacts will not be affected by the Act. Furthermore, the compact will not derogate any power within the jurisdiction of any signatory. Signatories may enact additional legislation complementary to the compact. No compact provision is to be construed as invalidating any law of any signatory. The compact provisions are severable. Amendments may be initiated by any signatory. Withdrawal of any signatory may be accomplished after one year's notice. (Hart-Florida)
W72-00205

REGULATIONS CONCERNING TREATMENT OF WASTEWATERS, DOMESTIC AND INDUSTRIAL, SEPARATELY OR IN COMBINATION, DISCHARGED INTO THE WATERS OF THE HACKENSACK RIVER.
For primary bibliographic entry see Field 05D.
W72-00206

REGULATIONS CONCERNING TREATMENT OF WASTEWATERS, DOMESTIC AND INDUSTRIAL SEPARATELY OR IN COMBINATION, DISCHARGED INTO THE WATERS OF THE ATLANTIC COASTAL PLAIN, INCLUDING THE ATLANTIC OCEAN.
For primary bibliographic entry see Field 05D.
W72-00208

REGULATIONS CONCERNING TREATMENT OF WASTEWATERS, DOMESTIC AND INDUSTRIAL, SEPARATELY OR IN COMBINATION, DISCHARGED INTO THE WATERS OF THE WALLKILL RIVER BASIN.
For primary bibliographic entry see Field 05D.
W72-00209

REGULATIONS CONCERNING TREATMENT OF WASTEWATERS, DOMESTIC AND INDUSTRIAL, SEPARATELY OR IN COMBINATION, DISCHARGED INTO THE WATERS OF THE PASSAIC RIVER INCLUDING THE NEWARK BAY.
For primary bibliographic entry see Field 05D.
W72-00210

REGULATIONS CONCERNING TREATMENT OF WASTEWATERS, DOMESTIC AND INDUSTRIAL, SEPARATELY OR IN COMBINATION, DISCHARGED INTO THE WATERS OF THE RARITAN RIVER BASIN INCLUDING THE RARITAN BAY.
For primary bibliographic entry see Field 05D.
W72-00211

REGULATIONS CONCERNING TREATMENT OF WASTEWATERS, DOMESTIC AND INDUSTRIAL, SEPARATELY OR IN COMBINATION, DISCHARGED INTO THE WATERS OF THE DELAWARE RIVER BASIN.
For primary bibliographic entry see Field 05D.
W72-00212

UNITED KINGDOM: OIL IN NAVIGABLE WATERS ACT OF 1971.
International Legal Materials, Vol 10, No 3, p 584-590, May 1971. 7 p.

Descriptors: *Environmental sanitation, *Oil, *Ships, *Logging (Recording), Legislation, Legal aspects, Water law, Governments, Regulation, Ju-

risdiction, Oil wastes, International waters, Water pollution sources, Administration, Oceans, Hydrofoils, Transportation, Pollution abatement, Oily water, Water pollution control.
Identifiers: *United Kingdom.

The Oil in Navigable Waters Act amends two prior acts and provides for the prevention of sea pollution by oil. The owner or master of any ship registered in the United Kingdom from which oil is discharged into any part of the sea outside the territorial waters of the United Kingdom shall be guilty of an offense. If the discharge is within territorial waters, criminal guilt is specified according to circumstances surrounding the discharge. It shall be a defense that neither the escape nor any delay in discovering it was due to any want of reasonable care and that all reasonable steps were promptly taken for stopping or reducing the discharge. In an extensive amendment, the record-keeping of all oil operations involving a ship is required. Fine limits for certain offenses is increased from one thousand to fifty thousand pounds. The Secretary of State is given certain powers which may be exercised when a shipping accident threatens large scale pollution. These powers enable the Secretary to direct any action necessary to prevent or abate the pollution. (Johnson-Florida)
W72-00213

PICKENS V. HARRISON (DAMAGES TO IRRIGATION WELL CAUSED BY SALT WATER POLLUTION FROM OIL WELL).

246 S.W.2d 316-319 (Civ App Tex 1952).

Descriptors: *Texas, *Saline water, *Oil wells, *Water pollution effects, Irrigation wells, Water pollution, Water pollution sources, Pollutants, Irrigated land, Salinity, Rice, Crops, Water quality control, Water pollution control, Brine disposal, Oil wastes, Oil fields, Oil industry, Waste disposal, Pollutant identification, Analytical techniques, Judicial decisions, Groundwater movement, Legal aspects.

Plaintiff landowners sued defendant oil well owner to recover damages to plaintiff's lands caused by salt water intrusion into irrigation water. Plaintiffs contended that defendant had negligently allowed salt water from his oil well operations to run onto their lands, thereby polluting their irrigation well and ruining their rice crops. Defendant denied liability and contended that any pollution was partially caused by other neighboring oil wells. Defendant also sought to introduce a letter from a chemist to the plaintiffs allegedly stating that analysis of the salt content of the irrigation wells showed that the water was not polluted. In affirming a jury verdict and judgment for plaintiffs, the Court of Civil Appeals of Galveston, Texas, held that the evidence produced by plaintiffs was sufficient to support a verdict for them. In a suit for damages caused by water pollution, a letter from a non-party third person relating to chemical analysis of the water is hearsay evidence and is inadmissible. According to evidence related to the geography and soil condition of the property, there was ample support for a finding that the water pollution was caused solely by defendant's well. (Smiljanich-Florida)
W72-00214

WATERS--TIDAL WATERS--POWER OF LEGISLATURE TO AUTHORIZE POLLUTION OF FISHERIES.
For primary bibliographic entry see Field 05G.
W72-00215

POLLUTION OF WATERS.
Florida Dept. of Air and Water Pollution Control, Tallahassee.

Florida Administrative Code, Ch. 17, secs. 3.01 thru 3.21.

Descriptors: *Florida, *Water pollution control, *Water quality control, *Standards, Water pollution, Regulation, Solid wastes, Legal aspects, Waste disposal, Waste treatment, Sludge, Toxicity, Test procedures, Testing, Drainage practices, Drainage wells, Permits, Waste water disposal, River basins, Legislation.

In order to more properly protect the waters of the state of Florida, the Air and Water Pollution Control Board has declared that the presence of pollutants in excess of concentrations prescribed in these rules is harmful to the waters of the state, and that the presence of such excessive concentrations is deemed to be prima facie evidence of prohibited water pollution. The rules prescribe certain minimum conditions for all waters in the state which require that waters be free from all settleable, floating, deleterious, and toxic substances. All tests or analytical procedures to determine compliance or non-compliance with water quality criteria must be in accordance with methods approved by the rules. In addition, the rules prescribe the specific technical water quality standards for the various classifications of waters in the state. Other provisions of the rules deal with: (1) permits for drainage wells, (2) applications for permits, (3) drilling requirements for drainage wells, (4) revocation and modification of permits, (5) the filling of test wells and borings, (6) abandoned wells, (7) pollution surveys, and (8) classification or waters by river basins or sub-basins. (Gallagher-Florida)
W72-00216

OIL SPILL.
Florida Administrative Code, Ch. 16B, secs. 16.01 thru 16.08, 1971.

Descriptors: *Florida, *Permits, *Oil spillage, *Ships, Regulation, Legislation, Legal aspects, Administrative agencies, Administration, Insurance, Water pollution, Water pollution control, Water pollution sources, Damages, Oily water, Oil industry, Pollutants, Pollution abatement.

These rules promulgated by Florida's Department of Natural Resources provide that an application to the Department for a terminal facility registration certificate and license shall be accompanied by an application fee and annual license fee. Capacity schedules are provided to determine these fees. These provisions apply to both liquid and nonliquid storage. Each operator of terminal facility or vessel, including any barge, who is required to furnish to the Department evidence of financial responsibility, is required to do so based upon the maximum liquid or nonliquid storage capacity. Such evidence of financial responsibility must be by: (1) evidence of insurance, (2) surety bonds payable to the governor conditional to pay costs of clean up of any discharge and damages to the state or any person, (3) qualification as a self-insurer, or (4) other satisfactory evidence. Additionally, a terminal facility bunkering certificate of registration and license are required of any person for each business location to which tank trucks are assigned to off-load or on-load pollutants to or from any watercraft. A certificate of financial responsibility is required for vessels carrying oil or other hazardous materials as cargo. (Shelnut-Florida)
W72-00217

RULES AND REGULATIONS ESTABLISHING SURFACE WATER QUALITY CRITERIA.
For primary bibliographic entry see Field 05G.
W72-00219

POSSIBLE LIABILITIES ARISING FROM VIOLATIONS OF CONSERVATION ORDERS,
Cooke, Moulton, Bellingham and Longo, Billings, Mont.
F. Moulton.
Institute on Oil and Gas Law and Taxation, Vol 11, p 243-277, 1960. 35 p, 49 ref.

Descriptors: *Montana, *Oil industry, *Remedies, *Damages, Administrative agencies, Administration, Regulation, Legislation, Judicial decisions, Legal aspects. Texas.

The purpose of this article is to consider whether violation of a conservation ruling of a governmental agency affects liabilities of the parties concerned. An examination of the authorities dealing with violations of rules regulating the oil industry compels the conclusion that if a rule comes within the authority of a particular conservation act, if it is reasonably necessary to effectuate the act's purpose, and if it is reasonable and establishes a standard of conduct which can be reasonably comprehended and followed, then the violation of that rule may create a cause of action in an injured party. If it meets these tests, its violation may also be evidence of negligence or constitute negligence per se. If, however, the legislature did not intend that a rule's violation should affect substantive rights between the parties, no cause of action should be created for a violation, and it should not be evidence of negligence. If the rule is in derogation of the established law, authority to modify the law should not be presumed. If the rule fails to establish a standard of conduct which can be comprehended and followed, its violation should not affect the parties' rights. (Shelnut-Florida)
W72-00220

THE WATER POLLUTION CONTROL AGENCY: LEGAS BASIS, ADMINISTRATION REGULATIONS AND STAFFING,
Illinois State Dept. of Health, Springfield.
For primary bibliographic entry see Field 05G.
W72-00221

WATER POLLUTION CONTROL IN THE USSR AND EASTERN EUROPEAN COUNTRIES,
State Public Health Inspectorate (USSR).
For primary bibliographic entry see Field 05G.
W72-00222

WATER POLLUTION IN INTERNATIONAL LAW,
Advisory Commission on Water Pollution Control, Helsinki (Finland).
For primary bibliographic entry see Field 05G.
W72-00223

LIABILITY IN NATIONAL AND INTERNATIONAL LAW FOR DAMAGE THROUGH WATER POLLUTION,
Frankfurt Univ. (West Germany).
For primary bibliographic entry see Field 05G.
W72-00224

REGULATION ESTABLISHING WATER QUALITY CRITERIA FOR INTERSTATE AND INTRASTATE STREAMS.
For primary bibliographic entry see Field 05G.
W72-00225

GENERAL WATER QUALITY CRITERIA FOR THE DEFINITION AND CONTROL OF POLLUTION IN THE WATERS OF TENNESSEE.
Tennessee Stream Pollution Control Board, Nashville.
For primary bibliographic entry see Field 05G.
W72-00226

RURAL WATER AND SANITATION FACILITIES.

House of Representatives Report No. 847, 89th Cong, 1st Sess, 1965, 13 p.

Descriptors: *United States, *Rural areas, *Financing, *Treatment facilities, Federal government, Government finance, Grants, Sewage disposal, Legislation, Legal aspects, Administrative

agencies, Administration, Local governments, Planning, Community development.

The propose of this bill to amend the Consolidated Farmers Home Administration Act is to establish for rural communities a program of federal assistance in the construction of water and sanitation systems comparable to federal programs for urban communities. The need for such legislation is great, particularly in dairy areas and areas producing fresh fruits and vegetables. The bill expands the existing water facilities authority of the Farmers Home Administration to include grants and to encompass this program. It authorizes the Administration to make or insure loans to associations and public and quasi-public agencies to provide for the installation of drainage or waste disposal facilities. A grant cannot exceed fifty million dollars and cannot exceed fifty percent of the project's development cost. There are, however, three conditions which must be met. First, the project must serve a rural area which is not likely to decline in population below that for which it was designed. Second, the project must be designed so that there will be adequate capacity to serve present and future growth needs. Third, the project must be necessary for orderly community development. Definitional and financial limitation provisions are specified. (Shelnut-Florida)
W72-00227

INTER-GOVERNMENTAL MARITIME CONSULTATIVE ORGANIZATION: DRAFT CONVENTION ON CIVIL LIABILITY FOR POLLUTION DAMAGE.
International Legal Materials, Vol. 8, p. 453-465, 1969. 13 p.

Descriptors: *Foreign countries, *Ships, *Damages, *Oil industry, *Oily water, Remedies, Legislation, Legal aspects, Law of the Sea, Insurance, Administration, International law, Water pollution, Water pollution control.

Conscious of the dangers of marine pollution posed by the carriage of oil, the Inter-Governmental Maritime Consultative Organization recognizes the need for adequate compensation to those suffering damage caused by the escape of oil from ships, and desires to adopt uniform international principles for determining liability and providing compensation. The tentative draft provides that liability for damage shall attach to the ship's owner. He shall be liable for pollution damages, unless the damage results directly from acts of war, grave natural disasters, or intentional acts by the injured person. Shipowners will be required to maintain financial security to cover liability. Any claim may be brought directly against the insurer for the owner's liability. Two or more shipowners may be jointly and severally liable when the causes of the pollution cannot be separated. Limitation of liability is allowed unless the incident resulted from the owner's fault. To benefit from this limitation, the owner must set aside a fund in a sum representing the limits of his liability. Distributions from the fund are specified. Procedural aspects of any action are detailed. (Shelnut-Florida)
W72-00228

INTER-GOVERNMENTAL MARITIME CONSULTATIVE ORGANIZATION: DRAFT CONVENTION ON RIGHTS OF COASTAL STATES TO INTERVENE IN CASUALTIES ON THE HIGH SEAS CAUSING OIL POLLUTION.
International Legal Materials, Vol. 8, p. 466-470, 1969. 5p.

Descriptors: *Oil, *Water pollution sources, *International waters, *Ships, Pollution abatement, Water pollution, Water pollution control, Water quality control, International law, Foreign countries, Treaties, Oil industry, Oil wastes, Coasts, Political aspects, Negotiations, Administration, Regulation, Administrative agencies, Legislation, Legal aspects.

In order to protect national interests against the disastrous consequences of oil spill incidents, this draft convention has been proposed by the Inter-Governmental Maritime Consultative Organization. Parties to the convention could take such measures as may be necessary to prevent, mitigate, or eliminate grave and imminent danger to their coastlines from marine pollution by oil following a maritime casualty on the high seas. Warships are excluded from the provisions. Except in cases of extreme emergency, a andcted states would be required to consult with all other affected states, including the flag state and with experts as to the most beneficial measures to be taken. The Organization would maintain a list of experts. Factors to be taken into consideration in combating pollution are set forth. Any state causing damage to others in contravention of the provisions is obliged to pay compensation. Provisions are included for arbitration and concillation of any controversy between contracting parties. These procedures would be held in abeyance pending final disposition of any claims adjudicated in the courts of a contracting party. (Smiljanich-Florida)
W72-00229

INTERNATIONAL CONVENTION FOR THE PREVENTION OF POLLUTION OF THE SEA BY OIL, 1954 (AS AMENDED).
International Legal Materials, Vol. 9, p. 1-24, 1970. 24 p, 1 append.

Descriptors: *Ships, *Oil wastes, *Water pollution control, *Treaties, Oil, International waters, Oily water, Transportation, Oil industry, International law, Legal aspects, Foreign countries, Water pollution, Regulation, Organizations, Remedies, Water pollution sources, Accidents, Safety, Oceans, Harbors, Waste disposal, Waste dilution.

To prevent pollution of the sea by oil discharged from ships, the parties to this convention have agreed, with respect to ships registered in any of their countries or, if unregistered, having their nationality, to prohibit the discharge of oil or oily mixtures except under specified conditions. Specific conditions for allowable discharges have been established for oil tankers and other ships. The prohibition does not apply when the discharge: (1) is for the purpose of the safety of a ship, preventing damage to a ship or cargo, or saving life at sea; or (2) results from damage to the ship or unavoidable leakage if all reasonable preventive precautions have been taken after the occurrence of the damage or discovery of the leak. Each state is obligated to impose penalties for violation adequate in severity to discourage unlawful violation, and promote the provision of adequate port facilities to receive and dispose of oil wastes from ships. After twelve months from the convention's effective date, ships shall be fitted so as to prevent the escape of oil into the bilges, and the carrying of water ballast in oil fuel tanks shall be avoided if possible. (Gallagher-Florida)
W72-00230

AGRICULTURAL AND RELATED WASTES CONTROL.
For primary bibliographic entry see Field 05G.
W72-00231

ECOLOGICAL DETERMINANTS IN POLLUTION CONTROL SYSTEMS,
Bernard Coll., New York.
For primary bibliographic entry see Field 05G.
W72-00232

INABILITY OF TRADITIONAL FORMS OF POLITICAL ORDER TO ADAPT TO MODERN PROBLEMS OF INTERNATIONAL POLLUTION,
For primary bibliographic entry see Field 05G.
W72-00233

INTERNATIONAL DEVELOPMENTS IN WATER POLLUTION CONTROL: PRINCIPLES OF RESPONSIBILITY: CONTINENTAL EUROPE,
Columbia Univ., New York.
For primary bibliographic entry see Field 05G.
W72-00234

GOALS AND STRATEGIES FOR COMBATING INTERNATIONAL POLLUTION,
American Society of International Law, Washington, D.C.
For primary bibliographic entry see Field 05G.
W72-00235

INTERNATIONAL COOPERATION TO CURB FLUVIAL AND MARITIME POLLUTION,
For primary bibliographic entry see Field 05G.
W72-00236

UNITED STATES MISSION TO THE UNITED NATIONS,
For primary bibliographic entry see Field 05G.
W72-00237

THE 1969 BRUSSELS CONVENTION ON CIVIL LIABILITY FOR OIL POLLUTION,
New York Univ., N.Y. School of Law.
For primary bibliographic entry see Field 05G.
W72-00238

POSITIVE INCENTIVES AND NEGATIVE CONTROLS,
For primary bibliographic entry see Field 05G.
W72-00239

POSITIVE INCENTIVES AND NEGATIVE CONTROLS,
Delaware River Basin Commission, Trenton, N.J.
For primary bibliographic entry see Field 05G.
W72-00240

INTRODUCTION OF A BILL TO AMEND THE CLEAN AIR ACT AND THE FEDERAL WATER POLLUTION CONTROL ACT,
Senate, Washington, D.C.
E. S. Muskie.
117 Cong Rec 761-764 (daily ed February 3, 1971). 4 p.

Descriptors: *Industrial production, *Standards, *Federal government, *Water pollution sources, Industrial wastes, Public health, Environment, Water pollution, Air pollution, Inspection, Jurisdiction, Legal aspects, Legislation, Regulation, Administrative agencies, Water pollution effects, Project planning, Environmental effects, Industries, Industrial plants, Pollutant identification.

This Bill contains three significant findings: (1) many manufactured products may contain substances which adversely affect the environment, (2) the control of the adverse effects of these substances is not feasible at the point of product use, and (3) the Congress believes that it is necessary to protect and enhance air quality and protect public health through the regulation of the use of such substances in products at the point of manufacture. The Administrator of the Environmental Protection Agency, within 180 days after enactment, is to designate substances, which may be present in manufactured products, that may cause a violation of air or water quality standards. Before any new substance is introduced into commerce the manufacturer will be required to submit information to the Administrator on the composition and potential effect of such substance. The Administrator is empowered to prescribe standards for the use in manufactured products of any substances that have been designated as harmful to environmental quality standards. Enforcement provisions are also established through powers of inspection, condemnation, and seizure. (Horwitz-Florida)

W72-00241

A BILL TO AMEND THE FEDERAL POLLUTION CONTROL ACT, AS AMENDED.
House Bill 4388, 92d Congress, 1st Session (1971). 26 p.

Descriptors: *Water quality control, *Pollution abatement, *Waste disposal, *Planning, Water pollution, Water pollution control, Water quality, Federal government, Legislation, Water pollution sources, Industrial wastes, Administrative agencies, Administrative decisions, Waste treatment, State governments, Local governments, Interstate, Cooperatives, Legal aspects, Regulation, Standards.

The purposes of a proposed amendment to the Federal Water Pollution Control Act are to enhance environmental quality, establish a national policy for the prevention, control and abatement of water pollution, and plan future national water quality management for our Nation's population growth, industrial expansion, agricultural intensification, energy requirements, recreation, and conservation uses. To achieve these broad purposes, the Secretary of the Interior is required to prepare and develop comprehensive programs for eliminating or reducing water pollution and for improving the usability and condition of waters by controlling certain water pollution activities. Specifically provided are: (1) the waters which are subject to the procedures, remedies and abatement measures provided for in the bill; (2) the water pollution activities which are covered; (3) the standards and enforcement measures which will apply - state or federal; (4) the procedure for determining standards when the states fail to take appropriate action; and (5) the specific procedures and abatement provisions available. Except as otherwise provided, state and interstate action to abate pollution in included waters shall not be displaced by federal enforcement action. (Gallagher-Florida)
W72-00242

TAX TREATMENT OF POLLUTION CONTROL FACILITIES.
For primary bibliographic entry see Field 05D.
W72-00243

AN ACT TO BAN HIGH PHOSPHATE DETERGENTS.
Public Act No 248, Connecticut Laws, 1971.

Descriptors: *Connecticut, *Detergents, *Phosphates, *Water pollution control, Organic compounds, Inorganic compounds, Water pollution sources, Water quality control, Synthetic detergents, Soaps, Cleaning, Foaming, Water softening, Industrial water, Domestic water, Dairy industry.

Section 1 defines certain terminology used in the Act. Synthetic detergents are organic and inorganic cleaning compounds available for household, laundry, and industrial uses whether sold in the form of powder, crystal, liquid, spray, or bar. Polyphosphate builders are water softening and soil suspending agents barred by the Act except where essential for medical, scientific, or special engineering uses. Also defined are: (1) recommended use level, (2) dairy equipment, and (3) industrial cleaning equipment. Section 2 prohibits any person, firm, or corporation from selling, offering, or furnishing any synthetic detergent or detergent on and after February 1, 1972, unless the container label clearly specifies the polyphosphate builder or phosphorus ingredient content. Section 3 prohibits the sale or use of detergent containing more than 8 7/10% of phosphorous by weight and of detergent requiring a recommended use level containing more than 7 grams of phosphorus by weight. However, machine dishwashers, dairy equipment, beverage equipment, food processing equipment, and industrial cleaning equipment are exempt from these limitations. The sale of any detergent containing phosphorus is prohibited after June 30, 1973, except as to the exempted equipment. Section 4 states the amount of fine for each offense. (Rees-Florida)
W72-00244

AN ACT CONCERNING THE INSURANCE OR BONDING OF OIL COMPANIES AND CARRIERS.
Public Act No 190, Connecticut Laws, 1971.

Descriptors: *Connecticut, *Insurance, *Ships, *Oil wastes, *Water pollution control, Oil industry, Water pollution sources, State jurisdiction, Legal aspects, Damages, Costs, Remedies, Cost repayment, Seepage, Filtration, Oily water, Organizations, Water policy, Water quality control, Nonstructural alternatives.

Connecticut herein requires any individual, partnership, association, firm, corporation, or other entity operating a ship, barge, or vessel in or entering upon Connecticut waters to discharge or receive oil or petroleum products to post a $50,000 bond. The bond must be with a surety licensed to do business in Connecticut. Connecticut is to be reimbursed up to the amount of the bond for all costs connected with containing and removing any pollution arising from the discharge, spillage, seepage, or filtration of any oil or petroleum product from a ship. Amounts recovered under the bond may be in addition to other remedies available to Connecticut. No bond shall be released without certification by the Water Resources Commission that the ship has not polluted state waters. In lieu of the bond, the state may accept other evidence of financial responsibility upon approval by the Attorney General and the Water Resources Commission. Persons covered by the Act who fail to be bonded or present other evidence of financial responsibility shall be fined not more than $5000. The Act became effective July 1, 1971. (Rees-Florida)
W72-00245

CLEAN WATER FOR MISSISSIPPI'S ESTUARIES.
For primary bibliographic entry see Field 05G.
W72-00246

GREAT LAKES POLLUTION,
For primary bibliographic entry see Field 05G.
W72-00247

TANKER OWNERS VOLUNTARY AGREEMENT CONCERNING LIABILITY FOR OIL POLLUTION.
International Legal Materials, Vol 8, p 497-501, 1969. 5 p.

Descriptors: *Oil industry, *Ships, *International law, *Pollution abatement, International waters, Governments, Contracts, Water pollution, Water pollution control, Water pollution sources, Legal aspects, Foreign countries, Pollutants, Oil wastes, Remedies.

Certain tanker owners have taken affirmative action concerning oil pollution at sea by agreeing to certain liability for pollution damage. This Tanker Owners Voluntary Agreement Concerning Liability for Oil Pollution provides that participating owners will reimburse national governments for reasonable expenses incurred in preventing or cleaning up pollution resulting from the negligent discharge of tanker oil. A polluting tanker is rebuttably presumed negligent. Prevention or clean-up costs incurred directly by private parties would not be paid, but the tanker would be liable for governmental expenditures in abatement. Liability, however, only extends to land and structures on the polluted waters; fire or explosion damage, consequential damages, and ecological damages are not included. Additionally, to encourage tanker owners to mitigate pollution injury, expenses incurred by the tanker to prevent or clean up the pollution are reimbursed. The maximum liability is the greater of $100 per gross ton or $10 million. Liability under TOVALOP extends for at least five years, and a national government may enforce the TOVALOP provisions through arbitration procedures under the International Chamber of Commerce. The Agreement is administered by a company in London. (Hart-Florida)
W72-00248

JURISDICTION OF THE DEPARTMENT OF AIR AND WATER POLLUTION CONTROL,
B. B. Anderson, Jr.
1971 Florida Attorney General Reports, 071-13, February 1, 1971.

Descriptors: *Florida, *Water pollution control, *State jurisdiction, *Boundaries (Property), Jurisdiction, Water pollution, Administrative agencies, Water rights, Irrigation, Canal seepage, Chemcontrol, Water pollution sources, Chemicals, Tidal waters, Tidal effects, Drainage systems, Ponds, Lakes, Farm ponds, Legislation, Judicial decisions, Legal aspects, Agricultural chemicals, Supervisory control (Power).

In response to questions posed by the Director of the Department of Air and Water Pollution Control, Florida's Attorney General concluded that the Department may exercise its jurisdiction over waters which are entirely within private property boundaries when sufficient facts establish the reasonable possibility that such private lakes or ponds flow onto the property or water of another. The Department does not have authority under present law to regulate the use of pesticides, herbicides, and insecticides which may have an influence on the ecology if such chemicals are used by a person solely on his own property. However, should such poisonous chemicals pass onto the property of water of another, their presence, if potentially harmful to life or property, may constitute pollution subject to Departmental regulations. Where chemically treated waters are contained, the owner of such exempt private water is subject to control by agencies other than the Department. When treated waters can be released by opening structures, the Department can exercise control to protect nontreated receiving waters. The Department also has jurisdiction over uncontrolled canal systems mixing with tidal waters. (Shelnut-Florida)
W72-00249

JURISDICTION OF THE TRUSTEES OF THE INTERNAL IMPROVEMENT TRUST FUND,
R. L. Shevin.
1971 Florida Attorney General Reports, 071-59, April 6, 1971.

Descriptors: *Florida, *Beds, *Landfills, *Administrative agencies, Administration, Navigable waters, Ownership of beds, Legislation, Legal aspects, Jurisdiction, Administrative decisions, Supervisory power (Control), State jurisdiction, Land tenure, Local governments.

Several Florida officials requested the opinion of the Florida Attorney General as to whether the Director of the Trustees of the Internal Improvement Trust Fund should issue a letter of no objection concerning an application to fill an area comprising a land-cut section of the Intracoastal Waterway. Since a land-cut is an area of water which was formerly upland, it has been argued that a plan to fill such bottoms does not come within the jurisdiction of the Board. The Attorney General concludes that the filling of submerged lands bordering on Florida's navigable waters requires an application to the appropriate authority. The Board, accordingly, should issue no letter of no objection and should advise compliance with the statutory procedures. Since any private person desiring to add to lands bordering on Florida's navigable waters is statutorily required to apply to the county or city and to undertake specified administrative procedures, an applicant must always own the submerged lands which he proposes to fill. Also, the Board is statutorily charged with responsibility for

the supervision, conservation, and protection of the public lands under navigable waters. Therefore, the Board would have full authority to promulgate rules covering the filling of land-cut areas bordering on navigable waters. (Shelnut-Florida)
W72-00250

PRINCIPLES OF RESPONSIBILITY IN INTERNATIONAL LAW,
Columbia Univ., N.Y. School of Law.
L. F. E. Goldie.
In: Proceedings of the Conference on International and Interstate Regulation of Water Pollution, March 12-13, 1970, Columbia University School of Law, New York, New York, p 21-32. 12 p, 14 ref.

Descriptors: *International law, *Water pollution control, *Pollution abatement, *Oceans, Law of the sea, Remedies, International waters, Governments, Foreign countries, Water pollution, Fishing, Fish farming, Oil, Oil industry, Ships, Legal aspects, Treaties, Research facilities, Water pollution sources, Environment, Environmental effects, Ecology.

Newly developing technologies involving activities in the sea may greatly increase the risk of harm to others. Where a risk-causing enterprise is required to shield third parties and the environment from harm, its operating costs increase. Examples of such activities are: (1) seabed mining; (2) extracting suspended minerals from seawater; and (3) tidal power stations. Conversely, fish farming, health and recreational uses of the seabed, and scientific research activities may be inordinately vulnerable to pollution. Coastal states have a right of self-help in international law to protect such endeavors from the risk-causing activities. Furthermore, actions to abate pollution may be taken by coastal states. Canada's declaration of a 100 mile protection zone, and the English reactions to the Torrey Canyon spill are examples. Additionally, the recent trend in both public and private law international law has been towards strict liability for pollution. Five different regimes of liability should be adopted for the new ocean technology, dependent upon the social relations of the involved parties. Flags of convenience should not be permitted as a means of avoiding liability for pollution. (Hart-Florida)
W72-00251

LAWYERS AS HUMAN ENVIRONMENTALISTS ADVOCATE'S ENVIRONMENTAL ADVICE,
A. G. Greenwald.
Arkansas Lawyer, Vol 5, No 2, p 70-74, March 1971. 5 p, 32 ref.

Descriptors: *Environmental sanitation, *Water pollution control, *Pollution abatement, *Social values, Environment, Water pollution, Water quality, Water quality control, Federal government, State governments, Local governments, Cities, Regulation, Standards, Water policy, Political aspects, Industries, Social aspects, Social needs, Public health, Adjudication procedure.

A lawyer's most important contribution to society may be his role as a human environmentalist. Man's survival is dependent on pollution control. Machinery is necessary for progress, but man has the ability to use this machinery and still dispose of its waste products. An explanation of the roles of industry, government, scientific and academic communities, citizens groups, and the youth community in water pollution control is provided in this article. Congress, the executive, and the judiciary are all taking stronger positions on pollution. Civil liability for pollution is expanding. Expanded environmental budgets are necessary. Class actions are expanding group power. Local pollution standards are needed for local conditions, but governmental agencies use their police powers to facilitate their own polluting activities. Land use planning is necessary, and it must include long range regional environmental evaluation. Lawyers are probably the best force for environmental improvement. Attorneys properly advocating a client's cause for the responsible adoption and administration of pollution abatement standards suggests a new dimension in the scope of legal concerns. (Robinson-Florida)
W72-00252

THE USE OF THE CORPS OF ENGINEERS PERMIT AUTHORITY AS A TOOL FOR DEFENDING THE ENVIRONMENT,
Stanford Univ., Palo Alto, Calif. School of Law.
For primary bibliographic entry see Field 05G.
W72-00253

OIL POLLUTION CONTROL IN THE CANADIAN ARCTIC,
Ottawa Univ. (Ontario).
For primary bibliographic entry see Field 05G.
W72-00254

FEDERAL WATER POLLUTION LEGISLATION AND REGULATIONS WITH PARTICULAR REFERENCE TO THE OIL INDUSTRY,
Gulf Oil Co., Houston, Tex.
For primary bibliographic entry see Field 05G.
W72-00255

SUING THE POLLUTER: APPROACHES TO ACHIEVE STANDING,
For primary bibliographic entry see Field 05G.
W72-00256

TORT LIABILITY AND THE OIL AND GAS INDUSTRY,
Texas Univ., Austin. School of Law.
For primary bibliographic entry see Field 05G.
W72-00257

PULP-MILL WASTE-WATER DISCHARGES INTO PUGET SOUND: AN INDUSTRY VIEWPOINT,
Northwest Pulp and Paper Assocation, Seattle, Wash.
For primary bibliographic entry see Field 05G.
W72-00258

PROPOSED REGULATIONS OF THE DEPARTMENT OF INTERIOR ON OIL POLLUTION UNDER THE WATER QUALITY IMPROVEMENT ACT OF 1970.
For primary bibliographic entry see Field 05G.
W72-00259

LOANS TO RURAL AREAS FOR WATER SUPPLY AND SEWAGE DISPOSAL SYSTEMS.
For primary bibliographic entry see Field 05G.
W72-00260

INTERFERENCE WITH STREAMS AND WATERS; PROTECTION OF FISH AND GAME.

Alaska Statutes secs. 16.05.870 thru 16.05.900, 16.10.010 thru 16.10.050 (1968).

Descriptors: *Alaska, *Water pollution control, *Salmon, *Fish migration, Legislation, Legal aspects, Permits, Administrative agencies, Administrative decisions, Fish, Water pollution, Water pollution sources, Water quality, Water quality control, Damages, Water resources, Construction, Dams, Fish ladders, Fish passages, Spawning.

It is unlawful to obstruct, divert, or pollute water used by salmon for spawning. The erection of obstructions interfering with the free movement of salmon is prohibited. To render waters inaccessible to salmon one must obtain a permit from the Department of Health and Welfare. The Department may grant a permit to develop power or to obtain water for civic, domestic, irrigation, manufacturing, mining, or other purposes. The Department may, however, require fish ladders. Money received from fines and penalties for violations of such provisions shall be available to the Department of Fish and Game. No vested rights granted by federal statute are affected. The Commissioner shall specify waterways important for spawning. The Commissioner must be notified of any projects which will pollute or affect the natural flow of such waterways. The approval of construction plans may be required before construction is begun. Absent approval such construction may constitute a public nuisance. In addition to any court imposed penalty, the cost of restoring a waterbody shall be borne by the violator. In emergency situations, oral permits may be given for the removal or repair of obstructions. Violations of these provisions constitute misdemeanors. (Robinson-Florida)
W72-00261

WATER POLLUTION CONTROL ACT.
Minnesota Stat Ann secs 115.01 thru 115.50, as amended, (Supp 1971).

Descriptors: *Administrative agencies, *Minnesota, *Waste disposal, *Water pollution control, *Treatment facilities, Regulation, Legislation, Water pollution, Pollution abatement, Water quality control, Legal aspects, Administration, Supervisory control (Power), Standards, Permits, Inspection, Sewage treatment, Sewage disposal, Local governments, State governments, Jurisdiction, Industrial wastes, Water pollution sources.

The Minnesota Pollution Control Agency is herein given the responsibility of controlling and abating water pollution. The discharge of any waste material is prohibited unless such waste is discharged into a disposal system for which a permit has been granted by the Agency. Any order or ruling of the Agency shall not be effective unless a public hearing is granted to the adversely affected party. If an emergency exists, however, the Agency may make final orders and rulings without notice and hearing. All governmental subdivisions are ordered to cooperate with the Agency in pollution control. Any person responsible for an unauthorized or accidental discharge must notify the Agency. The discharge of waste without a permit or in violation of a permit is unlawful and punishable as a misdemeanor. The Agency is also given extensive control over municipal sewage treatment facilities to prevent, control, and abate pollution. The Agency shall classify all waters and specify standards of quality and treatment procedures for municipalities. The Agency is given authority to assume the powers of any local government, if necessary to achieve compliance with pollution control regulations. (Horwitz-Florida)
W72-00262

POLLUTION CONTROL AGENCY.
Minnesota Stat Ann secs 116.01, 116.05 thru 116.08, 116.10, 116.11, as amended, Laws 1969, Ch 1046.

Descriptors: *Minnesota, *Waste disposal, *Water pollution control, *Conservation, Solid waste, Air pollution, Pollution abatement, Water pollution, State governments, State jurisdiction, Regulation, Legislation, Legal aspects, Administrative agencies, Supervisory control (Power), Administration, Standards, Permits, Inspection, Water pollution sources, Natural resources, Remedies.

A pollution control agency is established to meet the variety of problems relating to water, air, and land pollution of the state, and to achieve a reasonable degree of purity of resources consistent with the maximum enjoyment and use in furtherance of the public welfare. All state departments and agencies are directed to cooperate in the performance of pollution control activities, and the governor is given the authority to order such cooperation if necessary. The powers and duties of the agency include: (1) the adoption of air quality

standards and emission standards; (2) the establishment of standards for the control of solid waste disposal to control and abate water pollution, and (3) the right to amend any rules as well as to grant variances to rules when necessary to further water pollution control. Provisions are established requiring all affected persons to comply with agency regulations and violations are made misdemeanors. Enforcement methods available to the agency include civil and criminal penalties and injunctive relief. The agency is also granted emergency powers to abate pollution when necessary without notice and hearings. (Horwitz-Florida)
W72-00263

LICENSING AND REGULATION OF USE OF OIL SPILL CLEANUP AGENTS.
California Administrative Code, tit. 23, State Water Resources Control Board, secs 2300 thru 2336 (1971).

Descriptors: *California, *Oil, *Water pollution sources, *Pollution abatement, Regulation, Administrative agencies, Chemical properties, Chemical analysis, Cleaning, Water pollution, Water quality control, Water pollution effects, Water pollution treatment, Water pollution control, State governments, Lakes, Reservoirs, Streams, Bays, Estuaries, Oceans, Permits, Legal aspects.
Identifiers: Oil spills.

In order to regulate the characteristics and application of substances applied for cleanup of oil spills so that the substances will effectively protect the environment, minimize public safety hazards, and protect the public welfare, regulations are herein set forth for the use of oil spill cleanup agents. Any agent applied in state waters must be licensed by the State Water Resources Control Board. Chemical criteria for licensing are detailed for all agents. Specific testing methods for the screening of agents are listed. Any agent intended to be applied to state waters to abate an oil pollution condition must meet a labeling requirement. Certain information must be provided in all licensing applications. Licenses shall be for terms of two years. Obtaining a license for an agent does not waive legal responsibilities of the manufacturer or user. Use of agents is specified for: (1) lakes and reservoirs, (2) surface streams, (3) bays and estuaries, and (4) ocean waters. The Board may authorize use of an unlicensed agent under emergency oil pollution conditions in any state waters. (Smiljanich-Florida)
W72-00264

SEWAGE DISPOSAL.

Missouri Ann Stat secs 306.250 thru 306.290 (1965).

Descriptors: *Missouri, *Boating regulations, *Sewage disposal, *Sewage treatment, Legislation, Regulation, Water law, Legal aspects, Water pollution control, Boats, Sewage, Treatment facilities, Inspection, Missouri River, Mississippi River, State governments, Sewage effluents, Water rights, Environmental sanitation, Sanitary engineering.

No marine toilet on any boat operated upon waters of the state shall be so constructed and operated as to directly or indirectly discharge any inadequately treated sewage into the waters. No boat shall be equipped to permit discharge from or through its marine toilet, or in any other manner, of any inadequately treated sewage at any time into the waters of the state, nor shall any container of inadequately treated sewage be removed from any boat and placed, left, or discharged into or near any waters of the state at any time by any person. Any marine toilet located on or within any boat operated on waters of the state shall have securely affixed to the interior discharge opening of the toilet a suitable treatment device in operating condition or some other authorized treatment facility or method. All sewage passing into or through the marine toilets shall pass solely through the devices. All boats located upon waters of the state are subject to inspection for the purpose of determining compliance with these provisions. These provisions do not apply to boats engaged in interstate commerce on the Missouri and Mississippi Rivers. (Johnson-Florida)
W72-00265

SALES AND USE TAX.
Missouri Ann Stat sec 144.030 (1970 Supp).

Descriptors: *Missouri, *Taxes, *Treatment facilities, *Environmental engineering, Legislation, State governments, Water law, Legal aspects, Administrative agencies, Water pollution control, Pollution abatement, Water pollution treatment, Environmental sanitation, Water pollution, Water districts, Assessments, Non-structural alternatives, Adjudication procedure.

Specifically exempted from certain provisions pertaining to the sales and use tax are: (1) tangible personal property purchased by a rural water district and (2) machinery, equipment, appliances and devices purchased or leased and used solely for the purpose of preventing or abating water pollution, and so certified as such by the executive secretary of the Missouri water pollution board, provided that any action by the executive secretary under this section may be appealed to the Missouri water pollution board, which may uphold or reverse said action. (Johnson-Florida)
W72-00266

WATER POLLUTION CONTROL.
Mississippi Laws 1970, ch 301.

Descriptors: *Mississippi, *Water pollution control, *Administrative agencies, *Water quality control, *Standards, Permits, Air pollution, Conservation, Public health, Waste disposal, Waste treatment, Sewage treatment, Water supply, Water demand, Water users, Treatment facilities, Construction, Classification, Investigations, Remedies, Damages, Federal government, Cities, Legislation.

This chapter of the Mississippi statutes provides a comprehensive plan for the control and abatement of air and water pollution, the conservation of the state's natural resources, and the control of water quality by a classification and permit system to regulate waste disposal. Provisions of the chapter include: (1) definitions pertaining to air and water pollution and facilities to control pollution; (2) discussion of the creation and organization of the Mississippi Air and Water Pollution Control Commission, its powers and duties; (3) discussion of prohibitions and the requirement of permits for the discharge of wastes into air or water; (4) discussion of standards for water quality and the manner of proceedings before the Commission concerning alleged violations; (5) discussion of required and discretionary inspections and investigations, the maintenance of records for municipal sewage treatment and disposal systems; (6) discussion of emergency rules, regulations, and penalties for violation of the chapter; and (7) appeals to Chancery Court from orders of the Commission. (Rees-Florida)
W72-00267

WATER POLLUTION ABATEMENT GRANTS TO SUBDIVISION OF THE STATE.
Mississippi Laws 1970, ch 422.

Descriptors: *Mississippi, *Treatment facilities, *Construction costs, *Cost repayment, Wastes, Waste disposal, Water pollution, Water pollution control, Taxes, Grants, Repayment contracts, Institutions, Local governments, Administrative agencies, Political aspects, Legal aspects, Legislation, State governments, Financing, Government finance, Pollution abatement.

Any political subdivision taking advantage of a water pollution abatement grant shall pledge for the repayment of such grant a portion of the reimbursement from state sales taxes to which it is entitled under Mississippi law. The Act relates to those political subdivisions desiring to construct waste disposal plants approved by the Mississippi Air and Water Pollution Control Commission. A repayment schedule, as approved by the State Tax Commission, shall provide for monthly payments, the largest not to exceed the smallest by more than 115%. The repayment of all funds received from the Water Pollution Abatement Fund shall be within not more than 20 years from the date of the grant. The State Tax Commission shall withhold monthly from the amount remitted to a political subdivision a sum equal to the next monthly payment and pay this withheld sum to the Water Pollution Abatement Fund. To receive a grant, a political subdivision must file a copy of the repayment agreement with the Mississippi Air and Water Pollution Control Commission, after which the Commission shall certify that the waste disposal plant has been approved. A copy of this certification is to be delivered and filed with the State Tax Commission. (Rees-Florida)
W72-00268

POWER FOR TOMORROW: THE SITING DILEMMA,
Consolidated Edison Co. of New York, Inc., N.Y.
For primary bibliographic entry see Field 05G.
W72-00269

THE CHALLENGE OF ENVIRONMENTAL QUALITY: AN OUTLINE OF REMEDIES TO MEET IT,
For primary bibliographic entry see Field 05G.
W72-00270

TAX DEDUCTIONS FOR POLLUTION CONTROL FACILITIES.

Virginia Code Ann sec 58-81.1 (1969).

Descriptors: *Virginia, *Waste storage, *Treatment facilities, *Amortization, Depreciation, Wastes, Waste disposal, Waste treatment, Administrative agenices, Institutions, Tax rate, Financing, Government finance, Real property, Equipment, Costs, Cost allocation, State governments, Water pollution, Water pollution control, Water quality, Water quality control.

This statute outlines the process by which every taxpayer, at his election and in lieu of the allowance for depreciation for any taxable year, shall be entitled to a deduction with respect to the amortization of the adjusted basis of any plant, equipment, or treatment system installed to prevent, reduce, or abate pollution. The statute applies to those pollution control facilities completed on or after July 1, 1946, pursuant to any order or other requirement, or with the consent and approval of the State Water Control Board. Written notice of an election to take the amortization must be filed with the Department of Taxation on or before the filing date of the return for the facilities first taxable year. The taxpayer must file at the time of election copies of recommendations, orders, and approvals issued by the State Water Control Board or State Air Pollution Control Board. No deduction is allowable except on depreciable property, except that where wastes are disposed of by lagooning such costs shall be subject to accelerated amortization. The statute does not apply when deductions exceed the cost of the facility. (Rees-Florida)
W72-00271

PRIVATE ACTION UNDER THE PUBLIC TRUST: AN ENVIRONMENTAL BILL OF RIGHTS FOR CALIFORNIA,
For primary bibliographic entry see Field 05G.
W72-00272

POLLUTION PLANT EQUIPMENT-TAX BENEFITS.
Wisconsin Stat Ann secs 70.11 (21), 70.111 (15), 71.04 (2) (b), 71.05 (1) (h), 71.07 (2) (d), 76.02 (10) (1969), as amended (Supp 1971).

Descriptors: *Wisconsin, *Treatment facilities, *Taxes, *Monetary benefits, Legislation, Legal aspects, Water pollution, Air pollution, Pollution abatement, Waste treatment, Water pollution control, Waste disposal, Depreciation, Amortization, Construction.

The Wisconsin statutes provide certain tax benefits to encourage individuals to invest in pollution control equipment. All property purchased or constructed with the approval of state agencies for the purpose of eliminating pollution of surface waters or the air is exempt from general property taxes. Where pollution abatement equipment is associated with income producing property only the abatement type property is exempt. All books and records of owners of property covered by this subsection shall be open to examination by the Departments of Natural Resources, Health and Social Services, and Revenue. A prerequisite to the exemption is the filing of an annual statement, after which the Department of Revenue will inform the taxing district of the property's tax status. Any liquid manure storage tank used by a farmer is also exempt. Certain other provisions allow for income tax benefits by allowing accelerated depreciation of the cost of waste treatment plants or pollution abatement equipment. The statutes describe acceptable methods for valuing this type of property and determining the amount of the depreciation deduction. (Gallagher-Florida)
W72-00273

PROTECTION OF INLAND WETLANDS; DISCHARGE OF WASTE OR DELETERIOUS SUBSTANCES.
Massachusetts Ann Laws, Ch 131, secs 40A, 41, 42 (Supp 1970).

Descriptors: *Massachusetts, *Water pollution control, *Fish conservation, *Freshwater marshes, Wetlands, Land reclamation, Public health, Legislation, Legal aspects, Dredging, Landfills, Marshes, Swamps, Administrative agencies, Administrative decisions, Regulation, Water pollution, Water quality control, Waste disposal, Damages, Fisheries, Marsh management, Aquatic environment.

The Commissioner of Natural Resources, with the approval of the Board of Natural Resources, for certain specified purposes may amend, adopt, or repeal orders regulating or restricting the alteration or pollution of inland wetlands. Administrative procedures and notice requirements are specified. The Director of Water Pollution Control may determine that any inland fisheries are valuable enough to warrant the regulation or prohibition of waste discharges. Upon notification of such a determination, the Director of the Division of Water Pollution Control shall take appropriate action. No one shall discharge wastes into any inland waters or alter such waters to the extent that fish or fish spawn are injured. This prohibition shall not apply to those properly authorized by the Director. One who kills or injures fish or fish spawn shall be liable in tort for twice the damage done. The Director shall establish the value of the loss and may negotiate a settlement. If such a settlement cannot be negotiated, the matter shall be determined by the courts. (Robinson-Florida)
W72-00274

ACQUISITION OF SURFACE LANDS FOR WATER QUALITY CONTROL.
Michigan Comp Laws Ann secs 425.171 thru 425.173, 425.181 thru 425.188 (Supp 1971).

Descriptors: *Michigan, *Water pollution control, *Condemnation, *Iron, Legislation, Legal aspects, Water law, Water pollution, Water quality, Water quality control, Condemnation value, Compensation, Eminent domain, Leases, Mining, Mine wastes, Beneficiation, Regulation, Administration, Settling basins.

Mining and beneficiating low grade iron ore are in the public interest. Land may be acquired by condemnation for storage, processing, and treatment if the person, corporation, or association has acquired at least 75% of the necessary land and is unable to purchase the rest, if the additional parcels are necessary for settling ponds and basins for prevention of water pollution. Adequate compensation must be paid. Lessees must pay the full amount of compensation for the lands condemned. The supervisor shall conduct a study to determine the necessary type of mining regulations; considerations are listed for him to follow in making this determination. The supervisor may also promulgate mining rules for certain stated purposes. Variances may be allowed if not contrary to the public interest. This act shall be administered and enforced by the supervisor, and his powers are set forth. Operators shall have to file plan maps with the supervisor, and performance bonds may be required if the operator's financial stability is in doubt. At the request of the supervisor the attorney general may institute an action for a restraining order or injunction to prevent violations. (Robinson-Florida)
W72-00275

MINERAL WELL ACT.
Michigan Comp Laws Ann secs 319.211 thru 319.236 (Supp 1971).

Descriptors: *Michigan, *Well regulation, *Well permits, *Mineral waters, Legislation, Water law, Legal aspects, State governments, Water pollution sources, Administrative agencies, Regulation, Administration, Water resources development, Wells, Groundwater, Permits, Subsurface waters, Drilling, Salts, Water pollution, Water pollution control, Waste disposal, Brines.

To prevent surface and underground waste, this Act provides for the control of the drilling, operating and abandoning of mineral wells. Underground waste is defined as damage or injury to potable water, mineralized water, and other subsurface resources. Surface waste means injury to surface waters, soils, animal, fish and aquatic life, or surface property from unnecessary seepage or loss from wells covered by these provisions. The State Geologist is designated as the Supervisor of Mineral Wells and is given the duty of preventing surface and underground waste. The administrative framework for the prevention of waste is herein set forth, including: (1) advisory board organization, (2) powers and duties of the Supervisor and the board, (3) rule promulgation and enforcement, and (4) a permit system. A permit is required before a person can drill a test well or any brine, storage, or waste disposal well. A public hearing concerning the need for such drilling may be held if the public interest is involved. The Supervisor may correct a specified condition if the owner fails to do so, and the owner will be liable for the expenses incurred. Penalties and jurisdictional boundaries are set forth. (Johnson-Florida)
W72-00276

THOMAS J. ANDERSON, GORDON ROCKWELL ENVIRONMENTAL PROTECTION ACT OF 1970.
Michigan Comp Laws Ann secs 691.1201 thru 691.1207 (Supp 1971).

Descriptors: *Pollution abatement, *Michigan, *Water pollution control, *Public rights, Air pollution, Legislation, State governments, Judicial decisions, Water law, Legal aspects, Water pollution, Water quality, Water quality control, Environmental sanitation, Remedies, Standards, Social aspects, Water resources, Natural resources, Adjudication procedure, Adoption of practices, Non-structural alternatives.

The attorney general, any state political subdivision, any instrumentality or agency of the state, any person, partnership, corporation, association, organization, or other legal entity may maintain an action for declaratory and equitable relief for the protection of the air, water, or other natural resources. Such parties may also intervene as a party in the judicial review of licensing, administrative, or other proceedings to protect the air, water, or other natural resources. Courts may direct the adoption of standards approved by the court. Plaintiffs may be required to post surety bonds. Evidentiary and procedural rules set forth. The court may grant temporary and permanent equitable relief or may impose conditions on defendants to protect natural resources. Courts shall adjudicate the impact of the defendant's conduct on such resources and the public trust therein. The doctrines of collateral estoppel and res judicata may be applied to prevent a multiplicity of suits. (Robinson-Florida)
W72-00277

PUBLIC BATHING BEACHES.
Michigan Comp Laws Ann secs 325.631 thru 325.635 (Supp 1971).

Descriptors: *Michigan, *Standards, *Swimming, *Beaches, Legislation, Water law, Legal aspects, Regulation, Administrative agencies, Recreation, Water policy, State governments, Local governments, Water pollution, Water quality, Water quality control, Public health, Environmental sanitation, Jurisdiction, Safety.

The director of the department of public health, in concert with the conference of local health officers, shall promulgate rules which shall contain minimum sanitation standards for determining water quality at bathing beaches open to the public which will be used by health officers of city, county, and district health departments to establish the safety of the water for swimming. The health officer or his authorized representative of the city, county or district health department having jurisdiction may test and otherwise evaluate the quality of water at bathing beaches open to the public to determine whether the water is safe for bathing purposes. If, in his opinion based upon the standards prescribed by the rules promulgated by the director, the water is unsafe for bathing, he may petition the appropriate circuit court for an injunction ordering the government agency or person owning or operating the bathing beach to close the beach for use by bathers or other measures that the court deems necessary to keep persons from entering thereon. (Johnson-Florida)
W72-00278

IN THE MATTER OF MERCURY STANDARDS.
For primary bibliographic entry see Field 05G.
W72-00279

INTERNATIONAL LAW AND POLLUTION OF INTERNATIONAL RIVERS AND LAKES,
British Columbia Univ., Vancouver. School of Law.
For primary bibliographic entry see Field 05G.
W72-00280

OIL POLLUTION PROBLEMS ON THE PACIFIC COAST,
British Columbia Univ., Vancouver. School of Law.
For primary bibliographic entry see Field 05G.
W72-00281

HOW WE GOT THE DIRTIEST STREAM IN AMERICA,
House of Representatives, Washington, D. C.
For primary bibliographic entry see Field 05G.
W72-00282

MAINE'S OIL SPILL LEGISLATION: CAN A STATE WITH AN EXTENSIVE INTEREST IN ITS COASTAL RESOURCES PROTECT ITSELF FROM INADEQUACIES IN NATIONAL AND INTERNATIONAL LAW,
Office of the Governor, Augusta, Ma.
For primary bibliographic entry see Field 05G.
W72-00283

RULES AND REGULATIONS FOR THE DEVELOPMENT, SUBMISSION AND ADOPTION OF WATER POLLUTION CONTROL AND ABATEMENT PLANS FOR SEWAGE DRAINAGE BASINS.
Washington State Dept. of Ecology, Olympia.
For primary bibliographic entry see Field 05G.
W72-00284

RULES AND REGULATIONS FOR MINERAL EXPLORATION.

Montana State Board of Land Commissioners, Department of State Lands, Helena, Montana, September 1971. 11 p.

Descriptors: *Montana, *Mineral industry, *Land reclamation, *Water pollution control, Regulation, Administration, Administrative agencies, Standards, Mineralogy, Mining, Drift mining, Hydraulic mining, Panning, Placer mining, Exploitation, Exploration, Reclamation, Water pollution, Water pollution sources, Water quality, Water quality control, Permits, Mine water.

No person shall engage in exploration for, or development or mining on or below the surface of the earth without a license or permit from the State Board of Land Commissioners. Certain exclusions are set forth. Permittees other than public or governmental agencies must deposit a performance bond. Necessary definitions are provided. Placer or dredge mining, rock quarrying, and peat mining operations are included within these regulations. The requirements for exploration licenses, development permits, and operating permits are set forth. The contents of the required reclamation plan are prescribed. The Board will presume that an operation is abandoned or completed as soon as ore ceases to be extracted for future use or processing. This presumption may be rebutted. The Board has the responsibility of setting levels of objectionable effluents safe to humans and the environment that may flow or be pumped out of open pits of more than two acres. Such discharges must be consistent with provisions of the Montana Water Pollution Control Act, and effluents from such a pit must meet appropriate water quality standards. (Robinson-Florida)
W72-00285

MULTI-MEDIA CONFRONTATION--THE ENVIRONMENTALIST'S STRATEGY FOR A 'NO--WIN' AGENCY PROCEEDING,
For primary bibliographic entry see Field 05G.
W72-00286

NEW ENGLAND INTERSTATE WATER POLLUTION CONTROL COMMISSION.
For primary bibliographic entry see Field 05G.
W72-00287

PARKS AND RECREATION--SANITATION.
For primary bibliographic entry see Field 05G.
W72-00288

OIL UPON THE WATERS,
For primary bibliographic entry see Field 05G.
W72-00289

CONTROL OF ESTUARINE POLLUTION,
J. B. Gilbert, and R. B. Robie.
Natural Resources Journal, Vol 11, No 2, p 256-273, April 1971. 18 p, 103 ref.

Descriptors: *Estuaries, *Environmental sanitation, *Land use, *Waste disposal, Water pollution effects, Saline water intrusion, Water quality control, Legislation, Administrative agencies, Regulation, Federal government, State governments, Cities, Submerged Lands Act, Water resources development, Water rights, Fishkill, Wildlife, Deltas, Thermal pollution, Zoning, California, Taxes, Treatment facilities.

The role of estuaries in the support of fish and wildlife is inconsistent with their intensive use by man. This inconsistency extends to both land and water environments. The federal government's legal basis for control emanates from the Constitutional Commerce, Property, General Welfare, and Treaty Powers. Various federal administrative agencies, including the Department of Interior, the Environmental Protection Agency, and the Army Corps of Engineers, have been delegated authority by Congress. State and local authority emanates from the police power and home rule. Estuarine management under the direction of water pollution control agencies regulates primarily municipal and industrial waste discharges. Federal-state conflicts over the exercise of jurisdiction over the ownership of submerged beds have been partially remedied by the Submerged Lands Act. President Nixon's treaty proposal establishing a 12-mile territorial sea would include estuaries under pollution standards. Improper application of the public trust doctrine, a weak tax base, and conflicting governmental jurisdiction have limited state and local estuarine management. Presently adequate water quality controls are only temporary substitutes for a comprehensive national land use program. Means to implement necessary environmental management policies are discussed. (Ress-Florida)
W72-00290

SEWER CONSTRUCTION.
Michigan Comp Laws Ann secs 323.401 thru 323.412 (Supp 1971).

Descriptors: *Michigan, *Grants, *Sewers, *Construction costs, Legislation, Water law, Legal aspects, Administrative agencies, State governments, Local governments, Financing, Priorities, Sewage, Projects, Water pollution control, Water pollution sources, Water pollution, Environmental engineering, Environmental sanitation.
Identifiers: *Collecting sewers.

This Act was designed to provide financial assistance to local agencies for the construction of collecting sewers to prevent the discharge of untreated and inadequately treated sewage or other liquid wastes into the waters of the state and to abate and prevent pollution of the waters in and adjoining the state. The state sewer construction fund was established to be used for state grants to local agencies for their construction of collecting sewers. The grants are limited to a certain percentage of the construction costs and are subject to other limitations. Priority of eligible projects is established by a point system, with points being awarded for such water pollution control needs as: (1) public health, (2) public water supply, (3) irrigation (4) recreational use, (5) aesthetic value, (6) water supply for animals, and (7) usefulness of fish or game for human consumption. The projects for which the grants are disbursed must be certified by the water resources commission from the eligibility list established by the commission and as approved by the legislature. (Johnson-Florida)
W72-00291

A BILL TO AMEND THE FISH AND WILDLIFE COORDINATION ACT IN ORDER TO PROTECT MARINE ENVIRONMENT BY REGULATING THE DUMPING OF WASTES IN THE COASTAL AND OCEAN WATERS OF THE UNITED STATES.

House Bill 3662, 92d Congress, 1st Session (1971). 10 p.

Descriptors: *Water pollution control, *Oceans, *Waste disposal, *Permits, Water pollution, Water quality, Water quality control, Pollution abatement, Federal government, Radioactive waste disposal, Toxins, Biological warfare, Chemicals, Water pollution sources, Industrial wastes, Administrative agencies, Administrative decisions, Standards, Waste treatment, Tertiary treatment, Ultimate disposal, Legal aspects.

A proposed amendment to the Fish and Wildlife Coordination Act is designed to protect the marine environment by regulating the dumping of wastes in the coastal and ocean waters of the United States. Ocean dumping would be prohibited unless a permit was obtained from the Administrator of the Environmental Protection Agency authorizing such dumping. In determining if the proposed dumping will damage the ecology of the marine environment, the Administrator must take into account certain enumerated factors, including: (1) the need for the proposed dumping, (2) the effect on human health, (3) the effect on fisheries resources, and (4) the effect of particular concentrations and volumes. Each permit issued shall specify: (1) the type and amount of waste material authorized to be dumped, (2) the location for dumping, (3) expiration date of the permit and (4) any other necessary special provisions. The administrator may not authorize the dumping of radioactive wastes, toxic industrial wastes or chemical and biological warfare materials. By 1976, tertiary treatment of all wastes would be a prerequisite to obtaining a permit. Penalties and enforcement measures are provided. (Gallagher-Florida)
W72-00292

STATE CERTIFICATION OF ACTIVITIES REQUIRING FEDERAL LICENSE OR PERMIT.
Environmental Protection Agency, Washington, D.C.

Federal Register, Vol 36, No 155, p 14764-14765 (August 1971). 2 p.

Descriptors: *Water pollution control, *Navigable waters, *treatment facilities, *Permits, United States, Federal government, State governments, Environmental sanitation, Environmental engineering, Administrative agencies, Water permits, Discharge (Water), Wastes, Waste disposal, Water pollution sources, Water policy, Water quality control, Standards, Interstate compacts, Construction, Maintenance, Legislation, Statutes, Legal aspects, Rivers and Harbors Act.
Identifiers: *Federal Water Pollution Control Act, *Environmental Protection Agency.

Section 21 (b) of the Federal Water Pollution Control Act requires applicants for federal permits to construct or operate facilities that may discharge refuse into navigable waters to provide the licensing agency with reasonable assurance that such activity will not violate prescribed water quality standards. Such certification is obtained from the respective state, appropriate interstate water pollution control agency, or the Environmental Protection Agency. Section 21 (b) further requires any applicant for a permit from the Corps of Engineers to discharge refuse into navigable waters to obtain certification from the state in which the applicant is located as to compliance with water quality standards. The Environmental Protection Agency must advise the Corps with respect to water quality standards and related water quality considerations involved in application for permits; to perform this function the Agency will rely heavily upon the state water quality certifications. Therefore it is proposed to amend Part 615 of Title 18, Chapter V, by inserting after subparagraph (3) of section 615.2 (a) a requirement that there be a statement specifying the water quality standards considered applicable to the proposed discharge which were taken into account in rendering the certification. (Rees-Florida)
W72-00293

WATER QUALITY STANDARD CERTIFICATIONS.
Federal Power Commission, Washington, D.C.

Federal Register, Vol 36, No 159, p 15669-15670 (August 1971). 2 p.

Descriptors: *Federal Power Act, *Water quality, *Hydroelectric power, *Discharges (Water), Navigable waters, United States, Hydroelectric plants, Hydroelectric project licensing, Administrative agencies, Permits, Standards, Water pollution, Water pollution control, Water policy, Legislation, Legal aspects, Water quality control.
Identifiers: *Water Pollution Control Act.

A notice is set forth herein of a proposed rule-making respecting the Federal Power Act's provision for filing exhibits relating to discharges into navigable waters of the United States and other activities affecting water quality standards. The rule making power originates in the recently passed Water Quality Improvement Act of 1970, which amends the Federal Water Pollution Control Act. Section 21 (b) of the latter Act provides that any applicant for a federal license to conduct an activity resulting in a discharge into navigable waters shall provide the licensing agency certification of reasonable assurance that the activity will not violate applicable water quality standards. The Federal Power Commission regulates hydroelectric facilities' direct and indirect discharges into navigable waters; under section 10 (a) of the Federal Power Act the Commission, as a licensing agency, must consider all relevant environmental factors, including the effects of a hydroelectric project upon water quality. The proposed rules set forth the manner in which licensees will comply with the statutory requirement. (Rees-Florida)
W72-00294

ENVIRONMENTAL CONSIDERATIONS IN DEPARTMENT OF DEFENSE ACTIONS.
Department of Defense, Washington, D.C.

Federal Register, Vol 36, No 160, p 15750-15755 (August 1971). 6 p.

Descriptors: *Federal government, *Military aspects, *Environmental effects, *Project planning, Programs, Decision making, Future planning (Projected), Legislation, Statutes, Environmental engineering, Administrative agencies, Coordination, Financing, Grants, Loans, Permits, Standards, Atmosphere, Water policy, Natural resources, Political aspects, Public health, Legal aspects.
Identifiers: *National Environmental Policy Act.

This regulation establishes Department of Defense policy, assigns responsibilities, and provides guidance for the implementation of the National Environmental Policy Act of 1969 requirement of a detailed environmental statement in proposals for legislation and other federal actions. Provisions apply to the Office of the Secretary of Defense, the Military Departments, the Joint Chiefs of Staff, Unified and Specified Commands, and Defense Agencies. Major actions significantly affecting the quality of the human environment are examined in their effect upon the atmosphere, water, natural resources, and other outlined values. The regulation seeks to create a coordinated network among participating agencies involved in preparing environmental statements concerning all military activities. The preparation and processing of environmental statements in considered. Each statement should contain: (1) a project description; (2) probable environmental impact of the proposed action; (3) unavoidable probable adverse environmental effects; (4) alternatives to the proposed action; (5) the relationship between local short-term use of the environment and maintenance and enhancement of long-term productivity; (6) irreversible, irretrievable commitments of resources involved in the proposed action; and (7) a summary sheet. Requirements are examined respecting: (1) draft statements, (2) final statements, (3) waiting period before initiating action, and (4) classified statements. (Rees-Florida)
W72-00295

PERMITS TO DREDGE OR FILL IN OR ABOUT ESTUARINE WATERS OR STATE OWNED LAKES.

North Carolina General Stat sec 113-229 (Supp 1969).

Descriptors: *North Carolina, *Permits, *Dredging, *Estuaries, State governments, State jurisdiction, Federal government, Legal aspects, Legislation, Supervisory control (Power), Administration, Administrative agencies, Excavation, Public health, Estuarine environment, Estuarine fisheries, Riparian rights, Artificial use, Recreation, Wildlife conservation, Public rights.

Before any excavation or filling project is begun in any estuarine waters, tidelands, marshlands, or state-owned lakes, the party desiring to take such action shall obtain a permit from the department of conservation and development. The department of water and air resources shall continue to coordinate projects affecting navigation with the United States Army Corps of Engineers. The statute specifies what information must be submitted to the department and requires that the following factors be considered in granting permits: (1) the value and usefulness of the project; (2) the effect of the proposed dredging and filling on public use of the waters; (3) the value and enjoyment of the property of any riparian owner; (4) public health, safety, and welfare, (5) conservation of public and private water supplies; and (6) fresh water, estuarine, or marine fisheries. The statute also establishes procedures to be followed in conducting public hearings on permit applications, as well as a system for judicial review of department determinations. Violations are designated as misdemeanors. Activities of the State Board of Health in mosquito control are exempted from this statute. (Horwitz-Florida)
W72-00296

TIDAL WATERS (EXCAVATING AND DREDGING REGULATION).
New Hampshire Revised Stat Ann secs 483-A:1 thru 483-A:4-a (Supp 1970).

Descriptors: *New Hampshire, *Tidal waters, *Dreging, *Excavation, Marshes, Swamps, Banks, Beds, Tidal marshes, Freshwater marshes, Coastal marshes, Wetlands, Channel improvement, Flood protection, Bulkheads, Coastal engineering, Public rights, Administrative agencies, Regulation, Permits, Land tenure, Water pollution control, Legal aspects, Structures.

No person may excavate or dredge any bank, flat, marsh, or swamp in and adjacent to any waters unless a written notice of intention and a detailed scale drawing of the proposed project is submitted to the New Hampshire Water Resources Board. As amended, the statute provides a definition of waters and adjacent areas, tidal and freshwater, that are covered by the requirements herein set forth. Preserving submerged lands and wetlands is declared to be for the public good and welfare. The Water Resources Board shall conduct a public hearing on the written proposal within 30 days of receipt of notice. It shall notify interested city and state administrative agencies and abutting landowners of the proposal's filing and hearing. The Board may deny a petition or require the installation of bulkheads or other retention-containment structures to prevent subsequent fill runoff into tidal waters. Provision is made for rehearings and appeals and the assessment of a landowner's damages. The Board may adopt reasonable rules and regulations to govern its proceedings and to carry out the chapter's purposes. (Rees-Florida)
W72-00297

NEW JERSEY WATER QUALITY IMPROVEMENT ACT OF 1971.
New Jersey Laws 1971, ch 173, New Jersey Session Law Service, p 676-678 (New Jersey Statutes Ann secs 58:10-231 thru 58:10-23.10).

Descriptors: *New Jersey, *Water pollution control, *Water quality control, *Pollution abatement, Legislation, Water law, Legal aspects, Water pollution, Water pollution sources, Water quality, Regulation, Administrative agencies, Administration, Oil, Oil wastes, Damages, Remedies, Pollutants, Cities, Waste disposal, Chemical wastes.

Direct and indirect discharges of hazardous substances, debris, or petroleum into state waters is prohibited. Violators shall undertake to remove such discharges to the Department of Environmental Protection's satisfaction. The Department may authorize another to remove such discharges at the expense of the responsible person. Specified penalties are established, which may be collected in summary proceedings. Persons who have discharged petroleum or hazardous substances into state waters may be liable only to the extent of $14,000,000 unless willful negligence or misconduct is involved. Injunctive relief may be obtained for prevention of violations of this Act. Acts of God and war shall be defenses to liability, tut the offender must still mitigate any damages. Some exceptions to the Act are provided subject to department approval. No ordinances or regulations of any county of municipality and no provisions of any other state law or regulation, which are more stringent than this Act, shall be superseded. No existing civil or criminal remedy for any wrongful act shall be excluded or impaired by this Act. (Robinson-Florida)
W72-00298

TERMINALS FOR THE LOADING OR DISCHARGE OF PETROLEUM OR CHEMICAL LIQUIDS OR PRODUCTS FROM VESSELS.
For primary bibliographic entry see Field 05G.
W72-00299

LICENSING OF PRODUCTION AND UTILIZATION FACILITIES--IMPLEMENTATION OF NATIONAL ENVIRONMENTAL POLICY ACT OF 1969.
Atomic Energy Commission, Washington, D.C.
For primary bibliographic entry see Field 05G.
W72-00300

NATIONAL OIL AND HAZARDOUS SUBSTANCES POLLUTION CONTINGENCY PLAN.
Council on Environmental Quality, Washington, D.C.

Federal Register, Vol 36, No 162, p 16215-16221 (August 1971). 7 p, 1 tab.

Descriptors: *United States, *Administrative agencies, *Water pollution control, *Oil industry, State governments, Local governments, Federal government, Administration, Water pollution, Pollution abatement, Adoption of practices, Coordination, Oil wastes, Water pollution sources, Industries, Legislation, Legal aspects.

The National Oil and Hazardous Substances Pollution Contingency Plan provides for a pattern of coordinated and integrated response by departments and agencies of the federal government to protect the environment from the damaging effects of pollution spills. Its objectives are to provide efficient and coordinated action to minimize damage from oil discharges, including containment, dispersal, and removal. This plan is effective for all navigable waters of the United States and is applicable to all federal agencies. While all federal agencies are responsible for minimizing the occurrance of spills and for developing a capability to respond promptly in cases of spills, state and local governments, industry groups, and the academic community are encouraged to commit resources

for response to a spill. Planning and response elements, including national and regional response centers, are established. Coordination of federal pollution control efforts at the scene of a spill is accomplished through the on-scene coordinator. The actions taken to respond to a spill are separated into the following phases: (1) discovery and notification, (2) containment and countermeasures, (3) cleanup and disposal, (4) restoration, and (5) recovery of damages and enforcement. Coordinating instructions are also specified. (Shelnut-Florida)
W72-00301

CLEAN OCEAN ACT.
New Jersey Laws 1971, ch. 177, New Jersey Session Law Service, p 702-704 (New Jersey Stat Ann secs 58:10-23.25 thru 58:10-23.33).

Descriptors: *New Jersey, *Water pollution control, *Administrative agencies, *Atlantic Ocean, Water pollution sources, Legislation, Water law, Legal aspects, Water pollution, Continental shelf, Marine fisheries, Coasts, Permits, Regulation, Oceans, Navigable waters, Ships.

The Commissioner of Environmental Protection shall formulate, promulgate, amend, and repeal rules and regulations controlling or preventing the loading of materials on vessels which would have adverse effects if disposed of at sea. The Commissioner may require permits for the handling or loading of materials to be disposed of at sea. Specified permit fees may be charged. The Department of Environmental Protection may bring an action for injunctive relief to prohibit violations. Penalties of up to $3,000 for each offense may be collected in summary proceedings. If the violation is of a continuing nature, each day shall constitute a separate offense. (Robinson-Florida)
W72-00302

NAVIGABLE WATERS: CERTAIN PRACTICES REGULATED.
North Carolina General Statutes sec 76-40 (1965), as amended, (Supp 1969).

Descriptors: *North Carolina, *Water pollution control, Pollutants, Administrative agencies, Legislation, Water law, Legal aspects, Water pollution, Water pollution sources, Pollution abatement, Regulation, Navigable waters, Wastes, Waste disposal, Navigation, Adoption of practices, Permits, Water quality control, Dredging, Construction, Fishing gear, Fishing.

It is unlawful to place or cause to be placed temporarily or permanently any waste materials in state waters. Such prohibition shall not include lawfully dredged spoil materials deposited in designated spoil areas. No signs shall be erected in any navigable waters without a federal permit and a permit from the Department of Administration. The permit requirement does not apply to commercial fishing nets, fish offal, ramps, boathouses, piers, or duck blinds. The state may remove such signs at the expense of the owner. Whenever any structure lawfully erected in navigable waters is abandoned it shall be removed within 30 days. The state may remove an abandoned structure, after notice to the owner, at the owner's expense. Navigable waters shall not include waters in any pond, reservoir, or impoundment used in connection with the generation of electricity. The Department of Conservation and Development shall enforce this Act in coastal waters. The Wildlife Resources Commission shall enforce it in inland waters. Violations of this Act constitute a misdemeanor and may be punished by a fine of up to $500 or six months imprisonment. (Robinson-Florida)
W72-00303

NORTH CAROLINA POLLUTION ABATEMENT AND INDUSTRIAL FACILITIES FINANCING ACT.
North Carolina Laws 1971, Ch. 159A, North Carolina Advance Legislative Service No 8, p 135-151.

Descriptors: *North Carolina, *Pollution abatement, *Government finance, *Administrative agencies, Water pollution, Air pollution, Water pollution control, Water quality, Water quality control, Environmental sanitation, Local governments, Legislation, Water law, Legal aspects, Financing, Industrial plants, Mills, Social aspects, Social needs, Water pollution treatment, Treatment facilities.

The governing body of any county is hereby authorized to create by resolution or ordinance a Pollution Abatement and Industrial Facilities Financing Authority. Methods of creating this body and its membership are explained. The general powers of such authorities and the requirements for leased projects are listed. Projects of these authorities shall be tax exempt. Requirements of construction contracts and the methods of issuing different types of bonds are set forth. Bonds may also be secured by trust agreements. Appropriate uses of revenue are explained. No authority shall have the power to exercise the right of eminent domain. Annual reports of each authority's activities must be submitted to the county governing body. Counties may dissolve these authorities when their purposes are fulfilled. No commissioner of any authority shall be subject to any personal liability by reason of his execution of any bonds. (Robinson-Florida)
W72-00304

WATER DIST. NO. 105, KING COUNTY V STATE (APPROVAL AND CERTIFICATION FOR SEWER SYSTEM CONSTRUCTION).
485 P.AD SS— .. (Wash. 1971).

Descriptors: *Washington, *Administrative agencies, *Sewage disposal, *Administrative decisions, Water pollution control, Water pollution treatment, Water pollution, Water districts, Construction, Pollution abatement, State governments, Legislation, State jurisdiction, Legal aspects, Municipal wastes, Industrial wastes, Waste treatment, Treatment facilities, Insitutional constraints.
Identifiers: Constitutionality.

Plaintiff water district sought a declaratory judgment against the Washington Pollution Control Commission invalidating on constitutional grounds a statute requiring water districts to obtain written approval and certification of necessity from the Commission before establishing and operating a sewer system. Plaintiff contended that the statute was unconstitutional because it had an insufficient title and contained two subjects. Plaintiff further contended that the statute unlawfully delegated legislative power to a state agency because the act did not provide definite and certain standards for the granting of approval and certification by the Commission. Defendant contended the act conformed to constitutional requirements and that sufficient guidelines were set forth in the statute. The Supreme Court of Washington noted that the title to the original act was sufficiently broad to include certifications for sewer systems. Where a title embraces a general subject, it is constitutional if the general and incidental subjects are rationally unified. The court ruled that the standard of necessity is a sufficient guideline for delegations of power to a state agency to approve and certify sewer systems, where the object is pollution abatement and public health. The judgment for defendant was affirmed. (Smiljanich-Florida)
W72-00333

PHILLIPS V. ALTMAN (COVENANT NOT TO SUE AS A DEFENSE TO A PUBLIC NUISANCE),

412 P.2nd 199-202 (Okla. 1966).

Descriptors: *Oklahoma, *Water pollution sources, *Oil wastes, *Easements, Contracts, Judicial decisions, Water law, Legal aspects, State governments, Water pollution, Pollutants, Leases, Oil, Ditches, Drainage systems, Waste disposal, Water pollution control, Streams, Land tenure, Real property, Adjudication procedure, Oil fields, Oil industry, Remedies.

Plaintiff landowners sought to recover pollution damages from defendant oil leasehold owners and operators. Plaintiffs acquired title to their land from defendants who had retained an easement for drainage over a portion of the land for the operation of an oil lease on adjacent land. Plaintiffs had also covenanted not to sue for any pollution arising from the adjacent oil lease. However, plaintiffs sued for damages arising because of the pollution of their land and stream by crude oil and other deleterious substances which defendants allegedly permitted to escape from their oil leases. The trial court held that the covenant not to sue was an absolute bar to plaintiffs' action and dismissed the action. On appeal, plaintiffs argued that the agreement authorizing the use of plaintiffs' ditch for the purpose of depositing deleterious substances was not binding when such actions constituted a public nuisance violative of public policy. The Supreme Court of Oklahoma affirmed the decision of the trial court. The court held that plaintiffs had not pleaded the creation of a public nuisance by defendants. The court also ruled that the easement for drainage and the covenant not to sue were not voil as contrary to public policy. (Johnson-Florida)
W72-00335

FARMERS CHEMICAL ASS'N V. UNION CAMP CO. (DENIAL OF JURY TRIAL WHEN INJUNCTION SOUGHT TO ABATE POLLUTION).
312 F. Supp. 214-216 (E.D.N.C. 1970).

Descriptors: *Pollution abatement, *United States, *Industrial wastes, *Adjudication procedure, Water pollution sources, Water pollution effects, Federal government, Judicial decisions, Legal aspects, Water law, Water pollution, Water pollution control, Effluents, Chemical wastes, Solid wastes, Waste disposal, Water utilization, Water rights, Relative rights, Impaired water quality, Public rights.
Identifiers: *Injunction (Prohibitory), Constitutionality.

Plaintiff downstream riparian landowner sought to enjoin defendant paper manufacturer from discharging industrial waste into a river in quantities harmful to plaintiff. Plaintiff, constructing a fertilizer plant downstream from defendant's plant, intended to use water from the river in the manufacture of its fertilizer. Plaintiff alleged that the discharge by defendant of solid and chemical industrial waste would cause his equipment to corrode and crack. Plaintiff sought a jury trial on grounds that the constitutional right to a jury trial should be recognized whenever possible. Defendant contended that there were no significant or compelling legal issues which needed to be decided by a jury. The United States Court for the Eastern District of North Carolina held that a plaintiff seeking only an injunction restraining the discharge of industrial waste into a river is not entitled to a jury trial. The court ordered that the motion to strike the jury be granted and transferred plaintiff's action to the non-jury docket. (Johnson-Florida)
W72-00343

SCURLOCK OIL CO. V. HARRELL (ACTION FOR DAMAGES TO LAND AND WATER FROM OIL PIPELINE LEAKAGE).

443 S.W.2d 334-347 (Civ. App. Tex. 1969).

Descriptors: *Texas, *Soil contamination effects, *Pipelines, *Leakage, *Oil, Soil contamination, Water pollution, Oil wastes, Water pollution sources, Oil fields, Corrosion, Chlorides, Subsurface waters, Surface waters, Soil water movement,

Soil investigations, Livestock, Mortality, Judicial decisions, Legal aspects, Oil industry, Sheep, Adjudication procedure, Damages.
Identifiers: Injunction (Prohibitory).

Plaintiff landowners brought an action to recover damages to land and water caused by an oil pipeline leakage. Plaintiffs also sought to permanently enjoin the pipeline's use. The trial court awarded damages of $20 per acre for the entire 160 acre tract where the injury occurred, awarded damages for the loss of 20 sheep, and granted a permanent injunction. Defendant oil company appealed. The Court of Civil Appeals of Texas reversed in part and held that: (1) the evidence supported findings that the negligence of defendant in permitting pipeline leakage was the proximate cause of the damage to plaintiffs, (2) defendant had a duty to exercise ordinary care in constructing and maintaining the pipeline, (3) the evidence was insufficient to support findings of diminution in the value of the entire tract, (4) the evidence supported a finding that the sheep were killed by the oil leakage, and (5) the permanent injunction was improperly granted where there was an insufficient showing of a lack of an adequate remedy at law.
W72-00353

GENERAL CRUDE OIL CO. V. AIKEN (GROUNDWATER POLLUTION BY SALINE WATER FROM OIL DRILLING OPERATIONS AS CREATING PERMANENT DAMAGES).
For primary bibliographic entry see Field 05G.
W72-00363

GULF OIL CORP. V. ALEXANDER (POLLUTION OF GROUNDWATER BY SEEPAGE FROM SALT WATER DISPOSAL PITS).

291 S.W.2d 792-795 (Civ App Tex 1956).

Descriptors: *Texas, *Remedies, *Saline water, *Regulation, *Waste water disposal, Water pollution, Saline water intrusion, Drilling, Legal aspects, Judicial decisions, State governments, State jurisdiction, Damages, Water pollution sources, Water quality, Oil industry, Oil wastes, Relative rights, Water supply, Industrial wastes, Public rights, Water law.

Plaintiff landowner sought to recover damages for the pollution of his fresh water from operations of defendant oil and gas lessee. The freshwater strata underlying plaintiff's farm, and supplying his irrigation well, was polluted by the seepage of salt water from a salt water disposal pit constructed and used by defendant in oil and gas operations on its leasehold adjoining plaintiff's farm. Defendant appealed a judgment of $22,320 awarded plaintiff by the trial court. Defendant contended that there was no evidence of any negligence in its disposal of salt water and that plaintiff's action was barred by a two-year statute of limitations. The Texas Court of Civil Appeals affirmed the trial court's decision, relying on Rule 20 of the Texas Railroad Commission. The court held that Rule 20 specifically prohibited the pollution of fresh water by the disposal of salt water without any reference to negligence. Therefore, plaintiff's case rested upon the simple showing of violation. The court also ruled that the action was not barred by the statute of limitations since the statute did not start to run until the pollution became apparent. (Horwitz-Florida)
W72-00381

INTERNATIONAL ENVIRONMENTAL PROBLEMS--A TAXONOMY,
Resources for the Future, Inc., Washington, D.C.
For primary bibliographic entry see Field 05C.
W72-00384

ROSS V. FINK (STATUTE PROHIBITING SALT WATER FLOW OVER SURFACE OF LAND INAPPLICABLE TO POLLUTION BY UNDERGROUND WATERS).

378 P.2d 1011-1014 (Okla 1963).

Descriptors: *Oklahoma, *Soil contamination, *Subsurface waters, *Legislation, Surface waters, Oil wells, Oil wastes, Saline water, Storage tanks, Salts, Seepage, Water pollution, Underground streams, Saline water intrusion, Soil water movement, Soil surfaces, Damages, Porosity, Soil contamination effects, Judicial decisions, Legal aspects.

Plaintiff brought an action to recover for injury to his grazing land from salt water emanating from a slush pit operated by defendant on plaintiff's property. Plaintiff contended that the saline water permeated the porous soil and was carried by subsurface waters and seeped through the soil damaging plaintiff's land. Upon defendant's appeal, the Supreme Court of Oklahoma reversed a jury verdict upon finding: (1) a statute providing that salt water shall not be allowed to flow over the surface of the land had no application to pollution from underground sources, (2) plaintiff's recovery would have to be based upon negligence or nuisance, (3) plaintiff's petition did not allege nuisance, and (4) the lower court instruction that negligence is not an element necessary to be proved before plaintiff has a right to recover relieved plaintiffs of proving negligence and was thus erroneous. (Rees-Florida)
W72-00387

PREVENTION OF STREAM POLLUTION BY SAWDUST; POWERS OF LOCAL GOVERNMENT CONCERNING WATER SUPPLIES.
Nevada Rev Stat secs 244.365, 266.285, 278.030, 278.150, 278.160 (1965).

Descriptors: *Nevada, *Water pollution control, *Municipal water, *Water resources development, *Local governments, Legislation, Water law, Legal aspects, Cities, Water pollution, Water pollution sources, Water quality, Water quality control, Water supply, Water sources, Water rates, Sawdust, Public utilities, Water works, Water resources, Water control, Water utilization, Conservation, Erosion, Long-term planning.

The board of county commissioners of any county may bring suits against any persons, firms, corporations, or associations depositing sawdust in waters of the state. A city council shall have the power to construct and maintain waterworks within or without the city. Its jurisdiction shall extend to waterworks outside the city and to all reservoirs, streams, canals, ditches, pipes, flumes, and drains necessary for maintaining the waterworks and protecting water from pollution. The power to construct, purchase, lease, and maintain water sources and structures rests within the city council. City councils may purchase, acquire, or lease stock in water companies and fix the rate to be paid for water. Cities and counties having not less than 15,000 population shall create a planning commission; smaller cities and counties may create a commission. The planning commission shall adopt a master plan which shall include a plan dealing with the conservation, development, and utilization of all natural resources. Such conservation plan shall deal with land and water reclamation, water pollution, soil and shore erosion, and the pollution of watersheds. (Robinson-Florida)
W72-00389

INTERSTATE WATER POLLUTION CONTROL.
Maine Rev Stat Ann tit 38, secs 491-A, 492, 494, 496-A, 496-B, 496-C, 532 (Supp 1970).

Descriptors: *Maine, *Interstate compacts, *Water pollution control, *Administrative agencies, Pollution abatement, State governments, Federal government, Industries, Agriculture, Recreation, Water users, Water quality, Water policy, Standards, Programs, Research and development, Classification, Education, On-site investigations, Permits, Bodies of water, Testing, Discharge (Water), Sewage, Waste treatment.

Maine reaffirms its support for a cooperative approach to the abatement and control of water pollution as embodied in the New England Interstate Water Pollution Control Compact. The New England Interstate Water Pollution Control Commission obtains its powers as conferred by acts of signatory states, including Maine. This Act describes the organization and operation of the Commission and the personnel and programs administered by it. The Commission may develop standards for the training, education, and experience required of personnel operating sewage and waste treatment plants and may administer programs of training and certification. Nothing herein requires the certification of any employee of a sewage or other waste treatment plant. The Commission shall establish and maintain a water quality sampling and testing network. Sampling shall be at places where waters cross the state boundaries of Maine. Unless conferred by law, the Commission shall not issue permits in connection with the discharge or treatment of waters or pass upon plans for waste treatment or collection equipment facilities. The Act outlines the method of appointment and tenure of Commission members.
W72-00397

PEOPLE V. CITY OF LOS ANGELES (MUNICIPAL SEWAGE DISPOSAL REGULATION BY THE STATE DEPARTMENT OF HEALTH).
189 P.2d 489-502 (Dist Ct App Cal 1948).

Descriptors: *California, *Sewage disposal, *Pollution abatement, *Treatment facilities, Regulation, Judicial decisions, State governments, State jurisdiction, Local governments, Damages, Remedies, Legal aspects, Water pollution control, Water quality control, Water pollution, Sewage, Waste disposal, Sewage treatment, Water pollution sources, Waste water disposal, Public health, Water pollution effects, Domestic wastes.

Plaintiff state department of public health sought an injunction to prevent further pollution by defendant municipalities and the city of Los Angeles. Plaintiff contended that defendants were discharging sewage through their sewage disposal works and submarine pipes into the Pacific Ocean adjacent to the Santa Monica Bay Beach. Due to community growth, the sewage treatment system was no longer adequate and plaintiff revoked defendants' permit. Plaintiff also contended that the state statute regulating sewage treatment had been violated by defendants, thus authorizing a court injunction against further operation. The municipalities contended they were not responsible for the pollution due to a contract agreement with the city of Los Angeles. Defendants also contended that plaintiff had to prove negligence, and that only Los Angeles could be sued. The trial court granted the injunction and ordered defendants to meet the requirements of the department of health. The District Court of Appeal affirmed the restraining order, holding defendants' actions constituted a public nuisance. Negligence need not be proved in a public nuisance action. Each municipality has the duty to conform to state health laws on sewage disposal. (Horwitz-Florida)
W72-00398

THOMPSON V. WALSH (INJURY TO CATTLE RESULTING FROM STREAM POLLUTION BY OIL LESSEE).
223 P.2d 357-361 (Okla 1950).

Descriptors: *Oklahoma, *Salinity, *Stock water, *Damages, *Oil fields, Saline water intrusion, Water pollution, Legal aspects, Judicial decisions, State governments, State jurisdiction, Relative rights, Water quality, Pollution abatement, Remedies, Water pollution sources, Oil industry, Oil wastes, Drilling, Cattle, Water pollution effects, Adjudication procedure, Saline water.

Plaintiff cattle rancher sought to recover damages for the injury of his livestock by defendant oil lease operator. The sole source of water for plaintiff's cattle was a stream which had been polluted by salt water from defendant's oil drilling operations. Plaintiff alleged that the stream was polluted by defendant's actions and that the injuries sustained by the cattle resulted from drinking such water. The trial court awarded a judgment to plaintiff and defendant appealed. Defendant contended that plaintiff had failed to establish a causal connection between the alleged pollution of the stream and the injury to the cattle and that there was no evidence that salt water had escaped or that the cattle drank from the stream. The Supreme Court of Oklahoma affirmed the trial court's judgment. The court held that plaintiff was not required to prove a causal connection, or that the death of the cattle was due to drinking of salt water produced from defendant's well, to a degree beyond all doubt. Plaintiff's evidence was held sufficient to reasonably exclude all other explanations. (Horwitz-Florida)
W72-00400

SUNRAY OIL CO. V. BURGE (ACTION AGAINST PETROLEUM PRODUCT MANUFACTURER FOR DAMAGE TO LIVESTOCK FROM DRINKING POISONOUS WATER.
269 P.2d 782-787 (Okla. 1954).

Descriptors: *Oklahoma, *Water pollution, *Oil wastes, *Livestock, Mortality, Water pollution sources, Water pollution effects, Oil wells, Saline water, Streams, Real property, Damages, Chemical wastes, Toxicity, Watercourses (Legal), Water properties, Water analysis, Effluents, Settling basins, Oxidation, Waste water treatment, Sulfur, Sulfates, Judicial decisions, Legal aspects.

Plaintiff livestock raisers brought an action against defendant manufacturer of petroleum products to recover for damage to land and livestock resulting from the pollution of water by poisonous chemicals. Plaintiffs maintained that chemicals escaping from defendant's refinery had polluted the streams on plaintiffs' land so as to make them unusable for raising livestock. The Supreme Court of Oklahoma reversed a judgment for plaintiff holding that: (1) where evidence fails to establish with reasonable certainty that damage resulting from a defendant's act or mission or that the injury resulted from defendant's acts, the judgment is not sustained by sufficient evidence; (2) to sustain an action based on negligence there must be a causal connection between the negligence and the injury received; and (3) a jury's verdict may be based on reasonable inferences from established facts, but may not be based on inferences drawn from other inferences. The fact that defendant's effluent water drained into plaintiffs' creek does not alone create an inference that the waters contained poisons injurous to cattle, especially when evidence established that defendant impounded its effluent water until the sulfide was rendered non-toxic by oxidation. (Rees-Florida)
W72-00401

WATER-ECONOMICS AND POLITICS,
For primary bibliographic entry see Field 06B.
W72-00407

MID-CONTINENT PIPELINE CO V CRAUTHERS (RELEASE OF SERVANT TORT-FEASOR).
267 P.2d 568-571 (Okla. 1954).

Descriptors: *Oklahoma, *Damages, *Legal aspects, *Pipes, Pollutants, Natural streams, Water pollution, Impaired water quality, Remedies, Judicial decisions, Oil, Oil wells, Oily water.

Plaintiff landowner sued defendant pipeline company for damages allegedly resulting from the pollution of a watercourse running through plaintiff's land. Defendant's servant operated an oil lease on land adjoining plaintiff's land. Defendant operated a pipe line which was used to transport oil from the lease of its servant. Plaintiff executed a release in favor of the servant. In attempting to transfer the oil, the servant turned the wrong valve and caused the oil to flow into the watercourse instead of the pipe line. Plaintiff contended that defendant had violated a statutory duty. Defendant contended that its liability existed solely because of the master-servant relationship, and that when the servant who is the sole tortfeasor is released, the liability of the master is extinguished. The Supreme Court of Oklahoma held that where the master is liable to a third party for the tort of his servant solely by reason of the doctrine of respondent superior, and no independent or concurring act of negligence by the master is shown, a valid release of the servant from liability operates to release the master. (Shelnut-Florida)
W72-00413

GLOBE AIRCRAFT CO. V. THOMPSON (DAMAGES FOR ACID POISONING OF CATTLE).
203 S.W.2d 865-868 (Civ. App. Tex. 1947).

Descriptors: *Texas, *Water pollution effects, *Acidic water, *Cattle, Water pollution, Dairy industry, Milk, Acids, Impaired water quality, Pollutants, Damages, Remedies, Judicial decisions, Legal aspects, Chemicals, Adjudication procedure.

Plaintiff dairy operator sought to recover damages from defendant corporation for the death and injury to his cattle as well as losses in revenue derived from the sale of milk. Plaintiff contended that defendant was negligent in allowing the escape of acid into a creek on plaintiff's land, causing the poisoning of the cattle. Defendant contended that the evidence provided no basis for segregating the damages suffered before defendant began to use the acid from damages suffered afterwards. Additionally, there was no basis for an award of damages for injuries suffered after defendant commenced the dumping into the ditch which led to the creek. The Court of Civil Appeals of Texas held that where there is no basis for determining how much of the damages suffered resulted from the wrongful acts of defendant and how much resulted from other causes, a judgment would be based on mere conjecture, and could not be upheld. Plaintiff, however, might be able to segregate his damages and thus be entitled to recover. Thus the cause was remanded rather than rendered. (Shelnut-Florida)
W72-00418

BOATING LITTER AND POLLUTION CONTROL.
Utah Code Ann. secs. 73-18a-1 thru 72-18a-18 (1968).

Descriptors: *Utah, *Boating regulations, *Water pollution control, *Waste disposal, Regulation, Administration, Administrative agencies, State governments, State jurisdiction, Legal aspects, Water pollution, Water quality control, Permits, Inspection, Standards, Water policy, Water pollution sources, Domestic wastes, Sewage, Legislation, Boats, Marinas.

The littering and polluting of water and lands by boating operations is strictly prohibited. The operator of a watercraft shall not permit any litter, human body waste, or other solid materials to be placed, thrown, deposited, or discharged into or upon the waters of the state, or lands adjacent thereto, if such action may render the water or lands unsightly, noxious, or otherwise unwholesome or detrimental to the public health or welfare or the enjoyment of the water or lands for all legitimate uses, including recreation. The use of marine toilets is prohibited unless such toilets are equipped with facilities that will adequately treat or hold waste in a manner capable of preventing pollution. The state parks and recreation commission shall establish rules governing marine toilet pollution control devices which must be met before such items may be sold in the state. Public marinas are required to maintain waste disposal facilities, and the commission is given the authority to inspect and enforce regulations against all marinas, watercraft, and other boating facilities. Violation of this act or regulations promulgated thereunder constitutes a misdemeanor. (Horwitz-Florida)
W72-00438

WATER QUALITY CRITERIA FOR SPECIFIED RIVER BASINS.
Kansas State Board of Health, Topeka.
For primary bibliographic entry see Field 05G.
W72-00449

RIVER POLLUTION IN INTERNATIONAL LAW,
For primary bibliographic entry see Field 05G.
W72-00450

ANNUAL PROGRESS REPORT 1969-1970.
Arkansas Pollution Control Commission, Little Rock.
For primary bibliographic entry see Field 05G.
W72-00451

LANDOWNER'S RIGHT TO RELIEF AGAINST POLLUTION OF HIS WATER SUPPLY BY INDUSTRIAL OR COMMERCIAL WASTE,
J. M. Purver.
39 A. L. R.3d 910-991 (1971). 82 p, 76 ref.

Descriptors: *Pollution abatement, *Land tenure, *Water pollution control, *Remedies, Water quality control, Water pollution, Waste water disposal, Riparian land, Riparian rights, Water rights, Legal aspects, Prior appropriation, Paper industry, Canneries, Railroads, Chemicals, Fertilizers, Land development, Creosote, Dairy industry, Saw mills, Real property, Relative rights, Judicial decisions, Industrial wastes.

Cases considering the right and remedies of a landowner to prevent or seek compensation for the pollution of a water supply by industrial or commercially produced wastes are collected in this annotation. In contradistinction to a reduction in quantity or a diversion, the annotation focuses upon the impairment of water quality. In determining the existence of a right to relief, theories of nuisance, negligence, and trespass are considered. The appropriateness of damages and injunctive relief is evaluated. Various factors determining the propriety of relief are examined, including: (1) water odor, (2) water discoloration, (3) water fitness, (4) animal death or injury, and (5) business interest injury. The annotation specifically considers relief granted or denied for pollution from such specific sources as: (1) paper mills; (2) food-processing plants; (3) woolen mills; (4) railroad yards; (5) tanning yards; (6) meat-packing plants; (7) hotels, restaurants or commercial dwellings; (8) creosote plants; (9) dairies; (10) sawmills; (11) chemical plants; (12) cemeteries; (13) private land developers; and (14) fertilizer plants. (Gallagher-Florida)
W72-00452

IMPLEMENTATION AND ENFORCEMENT PLAN FOR WATER QUALITY REGULATIONS.
Washington State Department of Ecology, Olympia.
For primary bibliographic entry see Field 05G.
W72-00453

SAN FRANCISCO BAY-DELTA WATER QUALITY CONTROL PROGRAM: FINAL REPORT.
California Water Resources Control Board, Sacramento.
For primary bibliographic entry see Field 05G.
W72-00454

POLLUTION PROBLEMS IN THE PETROLEUM INDUSTRY--CONSTRUCTION OF AND COMPLIANCE WITH FEDERAL AND STATE LAWS,
Mobile Oil Corp., Dallas, Tex.
For primary bibliographic entry see Field 05G.
W72-00455

CASES AND MATERIALS ON ENVIRONMENTAL LAW,
O. S. Gray.
Cases and Materials on Environmental Law, 1970. 1415 p, 2 append.

Descriptors: *Environmental effects, *Legal aspects, *Judicial decisions, *Water pollution control, Environment, Environmental engineering, Ecology, Environmental sanitation, Water pollution, Planning, Transportation, Water law, Administration, Governments, Legislation, Regulation, Weather modification, Waste treatment, Oil, Aesthetics, Pesticides, Herbicides, Radiation, Resource development.

Although this casebook is designed primarily as a teaching tool for law schools, it may also serve the practicing attorney as an introductory handbook. The relative novelty of the field permits the casebook to make more extensive use of statutory and administrative source materials, and to contain more lengthy excerpts from the cases than is customary. After consideration of principles and policies applicable to environmental law, the book gives general materials on the protection and use of resources and on the issues of standing and preemption. Functional problems and control programs are dealt with in relation to federal air and water pollution control, solid waste management, historic preservation, oil and hazardous materials, noise, aesthetics, utilities, weather control, herbicides, pesticides, and radiation. The legal implications of such federal legislation and programs as the Rivers and Harbors Act of 1899, the licensing of power facilities, and transportation projects are examined, as is the planning process, utilizing a detailed case study of the Miami Jetport planning process. The casebook concludes with a discussion of possible public action in the courts, including common law and statutory doctrines and such new ideas as the public trust and condemnation concepts. (Johnson-Florida)
W72-00456

WATER POLLUTION CONTROL PROGRAMS.
For primary bibliographic entry see Field 05G.
W72-00457

PETERSON V. TEXAS CO. (LIABILITY FOR DAMAGES CAUSED BY ESCAPE WASTES FROM OIL LEASE),
186 P. 2d 259-269 (Kan. 1947).

Descriptors: *Kansas, *Water pollution effects, *Oil wells, *Damages, *Saline water intrusion, Saline water, Judicial decisions, Legal aspects, Water law, State governments, Oil, Natural gas, Saline water-freshwater interfaces, Water pollution sources, Mortality, Odor, Pollutants, Waste disposal, Waste storage, Waste water disposal, Environmental effects, Soil contamination, Leases, Oil fields.

Plaintiff agricultural lessee sought to recover for injury to land from salt water and wastes escaping from defendant company's adjacent oil and gas lease. The escaping salt water contaminated the soil, polluted several wells, damaged the basement of plaintiff's house, and killed livestock and trees. Defendant contended that: (1) plaintiff's action was for permanent damages and was therefore barred by the statute of limitations, (2) res judicata should apply, and (3) the cost of pumping water out of plaintiff's basement was not in mitigation of damages. The Supreme Court of Kansas held that: (1) where all the damages claimed were temporary, an incidental claim for permanent damages would not make the action one for permanent damages for purposes of the statute of limitations and the doctrine of res judicata; and (2) a party is entitled to lessen the annoyance of having water in a basement by means of any reasonable expenditure. The Court found that plaintiff's claim for damages due to the loss of shade trees was incidental and did not make the action one for permanent damages. The court also found that there was no evidence to indicate that plaintiff's daily pumping of the basement was not in mitigation of damages. The judgment for plaintiff was affirmed. (Johnson-Florida)
W72-00458

TOWN OF BRAGGS V. SLAPE (LIABILITY FOR DAMAGES CAUSED BY MUNICIPAL DISCHARGE OF RAW SEWAGE).
250 P. 2d 214-217 (Okla. 1952).

Descriptors: *Oklahoma, *Water pollution effects, *Municipal wastes, *Damages, *Pastures, Mosquitoes, Odor, Judicial decisions, Legal aspects, Water law, Local governments, Competing uses, Public health, Water rights, Sewage disposal, Environmental sanitation, Sewage treatment, Sewage, Water pollution sources, Water pollution control, Sanitary engineering, Fouling, Stock water, Cattle.

Plaintiff landowner sought to recover for damages resulting from defendant city's discharge of raw sewage into a creek which crossed plaintiff's land. The creek became polluted and could not be used for farm and domestic purposes; offensive odors from the creek and swarms of mosquitoes attracted by the sewage caused plaintiff inconvenience and annoyance. Plaintiff contended that he had suffered injury from the annoyance and from the loss of the land as graxing pasture. Defendant contended that the action was barred by the statute of limitations. The Supreme Court of Oklahoma held that a decrease in the usable value of property and personal inconvenience and annoyance suffered because of offensive odors from a polluted stream are temporary damages or damages resulting from a temporary nuisance. Therefore, the court ruled that plaintiff's action relied only on the diminution of value within the statutory period. The court also determined that the decrease in value due to the construction of the sewage disposal plant was properly excluded from consideration as permanent damage occurring before the statutory period. The judgment for plaintiff was affirmed. (Johnson-Florida)
W72-00460

CITY OF BETHANY V. TWIN LAKES GUN CLUB (MEASURING DAMAGES TO PLAINTIFF'S LAKE FROM POLLUTION FROM CITY SEWAGE DISPOSAL PLANT).
236 P.2d 255-258 (Okla 1951).

Descriptors: *Oklahoma, *Cities, *Sewage disposal, *Damages, Water pollution, Water pollution sources, Water pollution effects, Municipal wastes, Sewerage, Chemical wastes, Treatment facilities, Sludge disposal, Pollutants, Streams, Lakes, Property values, Rent, Depreciation, Water utilization, Recreation, Judicial decisions, Legal aspects.

Plaintiff, a private corporation, sued defendant city for damages to its lake resulting from defendant's maintaining a nuisance in the operation of its sewerage disposal plant. Plaintiff sought $10,000 damages for the contamination and discoloration of the water that made the lake unfit for recreational use and $15,000 damages for its cost in draining the lake and removing harmful matter. Plaintiff recovered $4500. Upon appeal defendant contended the trial court erred in admitting incompetent evidence relating to fishing permits and the rental value of cabins. The Supreme Court of Oklahoma affirmed, holding that: (1) the measure of damages resulting from the maintenance of a temporary nuisance is the depreciation in the rental or usable value of the property during the time of its maintenance, limited by the statute of limitations; (2) evidence of the value of cabin sites and income to be derived from rental thereof and from the granting of fishing permits to the public on a commercial basis was relevant and properly admitted; and (3) evidence of the depreciation in rental value of plaintiff's property caused by the maintenance of the temporary nuisance was admissible as a guide to determining damages. (Rees-Florida)
W72-00461

PURE OIL V. RENTON (ACTION FOR DAMAGES TO REALTY FROM POLLUTION OF STREAM BY SALINE WATER).
248 P.2d 580-582 (Okla 1952).

Descriptors: *Oklahoma, *Water pollution effects, *Saline water, *Real property, Property values, Depreciation, Water pollution sources, Oil industry, Oil wastes, Watercourses (Legal), Livestock, Cattle, Hogs, Water pollution, Damages, Water properties, Salinity, Water analysis, Easements, Judicial decisions, Legal aspects.

Plaintiffs brought an action against defendant petroleum company for damages to the value of their realty caused by the pollution of a stream by saline water discharged from defendant's operations. Plaintiffs contended that the pollution had denied them the profitable use and benefit of their farm to raise livestock. Defendant had an easement across plaintiffs' property allowing salt water and other deleterious substances to flow into the stream running through plaintiffs' land. After the easement expired, defendant took no action to prevent the pollution. The Supreme Court of Oklahoma upheld defendant's contention that the judgment for plaintiff had been on insufficient evidence, holding: (1) plaintiffs failed to produce evidence of the land's value for raising livestock and its impaired value due to defendant's act; (2) the true measure of damages is the depreciation of the usable land value; and (3) plaintiffs failed to present evidence of a water analysis of the polluted stream to justify the award of damages. (Rees-Florida)
W72-00463

WOOD OIL CO. V. VENDICOTT (DAMAGE TO REALTY AND PERSONALTY FROM OIL WELLS).
234 P.2d 371-375 (Okla 1951).

Descriptors: *Oklahoma, *Oil wells, *Water pollution sources, *Remedies, Water pollution effects, Salinity, Judicial decisions, Legal aspects, Water law, Water pollution, Streams, Oil wastes, Oil, Oil fields, Saline water, Brines, Damages, Adjudication procedure.

Plaintiff landowner sued defendant oil company for permanent damages resulting from the pollution of a stream which ran through his pasture. Defendant allowed salt water and other deleterious substances to escape into the stream from his oil wells. The pollution of the stream resulted in the death and sickness of plaintiff's cattle and reduced the value of his land as pasturage. Defendant denied liability and argued that plaintiff contributed to his injuries. It was also argued by the defendant that there was a defect of parties as the plaintiff owned only the surface rights in the land and not the mineral rights. The jury returned a verdict and lumpsum award for plaintiff. The Supreme Court of Oklahoma held that where a petition consists of a cause of action for damage to personalty and a cause of action for damage to realty, and both result from pollution, a lumpsum award is not erroneous. The judgment for plaintiff was affirmed. (Robinson-Florida)
W72-00465

NORTH V. EVANS (DAMAGE TO LAND FROM SALT WATER DISCHARGED FROM OIL WELLS).
185 P.2d 901-905 (Okla 1947).

escriptors: *Oklahoma, *Oil wastes, *Saline water, *Damages, *Pollutant identification, *Chemical analysis, Waste water (Pollution), Judicial decisions, Legal aspects, Water pollution, Pecans, Water pollution sources, Oil wells, Water pollution effects, Soil analysis, Soil contamination effects, Soil contamination, Pollutant identification, Trees, Remedies, Adjudication procedure.

Plaintiff sought to recover damages for injuries to his land allegedly caused by salt water escaping from two oil wells on a lease operated by defendant. Plaintiff contended that the salt water had polluted the soil and resulted in the destruction of a large number of pecan trees. Defendant contended that evidence of the chemical analysis of certain leaves and soil should not have been admitted because the samples were not proven to be similar to leaves and soil on plaintiff's land. Defendant also asserted that no connection had been shown between the salt water and plaintiff's injuries, and he contended that the action should have been barred by the statute of limitations. The Supreme Court of Oklahoma, affirming the judgment, held that in an action to recover damages to land from salt water escaping from oil wells, evidence as to the result of a chemical analysis of leaf and soil samples is admissible upon a showing that the samples were taken at or about the time of the alleged injury to the land or the trees thereon. The court ruled that plaintiff's action was not barred by a two-year statute of limitations because the damage to plaintiff's land became obvious within the statutory period. (Johnson-Florida)
W72-00466

THE ANNUAL REPORT OF THE COUNCIL OF ECONOMIC ADVISORS, 1966.
For primary bibliographic entry see Field 05G.
W72-00467

TRANSCRIPTS OF THE SPEECHES, NATIONAL CONFERENCE ON ENVIRONMENTAL LAW.
California Univ., Berkeley.

National Conference on Environmental Law, Berkeley, California, November 1971. 229 p, 2 tab.

Descriptors: *Pollution abatement, *Environmental sanitation, *Legal aspects, *Conferences, Environmental effects, Legislation, Environment, Ecology, Industries, Federal government, State governments, Administrative agencies, Decision making, Remedies, Damages, Water pollution control, Water quality control, Government finance, Adjudication procedure, Taxes, Economics, Costs, Land management.
Identifiers: *National Conference on Environmental Law.

Environmental lawyers in private litigation can assume a leadership role in rebuilding environmental quality. The principal issues confronting lawyers seeking to protect the environment from pollution and the destruction of natural resources are discussed in this series of speeches. Congressman McCloskey suggests legislation is ineffectual until the federal government applies national land-use controls and uses economic incentives to promote pollution control. David Sive examines procedural and monetary problems involved in litigating environmental lawsuits against industrial polluters. Frederick Fisher suggests techniques useful to the private environmental lawyer litigating before and against administrative agencies. Philip Verleger discusses the difficulties counsel for industry may encounter and suggests means to represent industry regarding pollution regulations and quantitative standards. Philip Berry explores the use of imaginative new environmental protection theories that are replacing traditional statutory and common law measures. A table of statutes and rules and a table of cases are provided. (See also W72-00469 thru W72-00474) (Rees-Florida)
W72-00468

THE LEGAL FUTURE: NEW THEORIES OF ENVIRONMENTAL PROTECTION,
California Univ., Berkeley.
P. S. Berry.
In: Transcripts of the Speeches, National Conference on Environmental Law, p 183-207, November 1970. 25 p.

Descriptors: *Environmental sanitation, *Remedies, *Legislation, *Pollution abatement, Natural resources, Resource allocation, Environmental effects, Conservation, Water pollution, Water pollution control, Air pollution, Federal government, State governments, Administrative agencies, Government finance, Industries, Forest management, Oil industry, Livestock, Mining, Lumbering, Land management, Taxes, Decision making, Legal aspects.
Identifiers: National Environmental Protection Act.

Historical approaches to conserving natural resources through statutory and common law means provide solely remedial measures. Recent trends in tort law evidence stronger methods of environmental protection. This has been achieved by broadening the concept of causation and imaginative applications of the public trust doctrine. Comprehensive protection of the environment may result from either a constitutional amendment creating a new civil liberty or stronger state statutes. The 1970 Michigan Environmental Protection Act is discussed, with emphasis upon what this new legislation will accomplish. The National Environmental Policy Act is criticized for its failure to prohibit ecologically unsound activities. The concept of corporate responsibility for private industry is discussed, and the traditional polarity between the private profit motive and national environmental preservation is considered. Environmental solutions must alter the basic nature of private industry. Possible means of attaining this include: (1) national law, (2) state law, and (3) voluntary charter amendment. Proposals are suggested for revising taxation objectives. The Public Land Law Review Commission's Report is criticized, and alternatives to its findings are proposed. (See also W72-00468) (Rees-Florida)
W72-00469

ECONOMIC AND TECHNICAL PROBLEMS IN ENVIRONMENTAL LITIGATION.
California Univ., Berkeley.

In: Transcripts of the Speeches, National Conference on Environmental Law, p 157-181, November 1970. 25 p.

Descriptors: *Judicial decisions, *Adjudication procedure, *Environmental sanitation, *Legal aspects, Environmental effects, Administrative decisions, Legislation, Administrative agencies, Scientific personnel, Professional personnel, Technical societies, Federal government, Industry, Evaluation, Water quality, Water pollution control, Waste disposal, Sewage, Water table, Nutrients, Water pollution, Zoning, On-site investigations, Thermal pollution.

This panel discussion examines the means by which an environmental lawyer may effectively use expert witness testimony to discuss technical areas litigated in both class actions and nuisance suits. Areas requiring technical expertise include: (1) pre-litigation preparation, (2) administrative and legislative hearings, and (3) trials. The discussion points out that governmental agencies and private industry may provide excellent expert witnesses. The qualifications and fees of experts are discussed. The mutual educational process between lawyers and experts is examined, especially regarding pretrial discovery and preparation. The concluding segment of the discussion deals with the effective use of expert testimony, the concomitant importance of scientific and technical questions and the selection and effect of experts at trial. Current obstructions to pollution control in the judicial, legislative, and administrative fields are examined. The emerging concept of corporate responsibility is considered by the panel. (See also W72-00468) (Rees-Florida)
W72-00470

THE FUNCTIONS AND FEATURES OF PRIVATE LITIGATION IN THE GROWTH OF ENVIRONMENTAL LAW,
California Univ., Berkeley.
D. Sive.
In: Transcripts of the Speeches, National Conference on Environmental Law, p 31-62, November 1970. 3 p.

Descriptors: *Water pollution control, *Legal aspects, *Environmental sanitation, *Adjudication procedure, Environment, Legislation, Judicial decisions, Federal government, Administrative agencies, Water resources development, Conservation, Water quality control, Water policy, Watershed management, Water resources, Standards, Hydroelectric plants, Federal Power Act, Costs, Economics, Damages, Remedies.

Private litigation by representative national or regional conservation organizations and ad hoc groups has been plagued by procedural difficulties such as improper standing to sue. An examination of Scenic Hudson Preservation Conference v. Federal Power Commission and Citizens Committee v. Volpe suggests that in order to meet the legally protected interest test plaintiffs must demonstrate themselves to be responsible representatives of the public interest. The problem of a multiplicity of suits resulting from recent environmental protection bills extending the right to sue on federal court to protect the environment is discussed. Methods to meet litigation expenses, prepare for litigation and to use discovery procedures to procure information are discussed. Utilizing the broad rights provided under the Federal Rules of Civil Procedure, as amended July 1, 1970, parties can gain access to necessary information by using oral depositions, written interrogatories, and adverse party procedure. The consequences to environmental groups of the Internal Revenue Service's news release suspending rulings on claims for tax-exempt status by public interest law firms is discussed. (See also W72-00468) (Rees-Florida)
W72-00471

THE LEGAL PROFESSION'S LEADERSHIP IN REBUILDING ENVIRONMENTAL QUALITY,
California Univ., Berkeley.
P. N. McCloskey, Jr.
In: Transcripts of the Speeches, National Conference on Environmental Law, p 11-29, November 1970. 19 p.

Descriptors: *Environmental sanitation, *Legal aspects, *Legislation, *Water quality control, Environment, Conservation, Water resources development, Water pollution control, Ecology, Water quality control, Waste disposal, Treatment facilities, Industrial wastes, Standards, Administrative agencies, Pollution abatement, Estuaries, Federal government, Financing, Taxes, Zoning, Water policy, Land management.
Identifiers: Clean Water Restoration Act, National Environmental Policy Act of 1969.

To meet the need for a new balance between development and preservation of the environment, the legal profession must provide leadership. Since 1969, Congress has promulgated significant new legislation, such as the National Environmental Policy Act which requires federal agencies to evaluate their programs' impact on the environment, and has funded existing legislative programs. For example, the Clean Water Restoration Act of 1965 provides federal assistance for secondary sewage treatment plants. The environmental lawyer should also utilize precatory language in other legislation when advocating a legislative intent to protect the environment. Any solution to the problems of land development and use will require a comprehensive revision of present laws and tax structures. To meet

the problems of local governments supported by property taxes, Congress must enact revenue-sharing programs and, perhaps, a national land use policy. The federal government must provide new economic incentives to encourage private parties to conduct pollution research within the confines of the free enterprise system. The private attorney has the opportunity to test and enforce these laws through litigation. (See also W72-00468) (Rees-Florida)
W72-00472

ENVIRONMENTAL LAWYER IN THE LION'S MOUTH: LITIGATION BEFORE AND AGAINST ADMINISTRATIVE AGENCIES,
California Univ., Berkeley.
R. F. Fisher.
In: Transcripts of the Speeches, National Conference on Environmental Law, p 63-112, November 1970. 50 p.

Descriptors: *Environmental sanitation, *Administrative agencies, *Adjudication procedure, *Judicial decisions, Federal government, State governments, Regulation, Legal aspects, Pollution abatement, Remedies, Damages, Permits, Standards, Projects, Land management, Resource development, Wildlife, Contracts, Hydroelectric plants, Thermal pollution, Water pollution control, Political aspects, Legislation.

The emergence of more environmentally oriented administrative agencies requires the environmental lawyer to understand how best to litigate before and against these agencies. Moreover, the environmental lawyer representing these agencies must understand how to counsel them regarding proposed regulations, agency lobbyists, and other interested groups. Techniques of administrative practice for private environmental lawyers are examined by reviewing selected cases that illustrate how a lawyer with limited finances can select high priority issues having national significance. These cases suggest judicial reversals often result from an agency's traditional hard-line, pro-industry outlook that impedes an impartial examination of the evidence. Testimony by experts before environmental agencies is discussed. The National Environmental Policy Act and its utilization are examined. Interim Guidelines pronounced by the Council on Environmental Quality are considered. Access to information through discovery under the Freedom of Information Act is explored in respect to a consideration of the problems of executive privilege and a directive permitting access to any person without qualification based upon need. (See also W72-00468) (Rees-Florida)
W72-00473

DEFENSES AND THE ROLE OF INDUSTRY LAWYERS,
California Univ., Berkeley.
P. K. Verleger.
In: Transcripts of the Speeches, National Conference on Environmental Law, p 113-134, November 1970. 22 p.

Descriptors: *Environmental sanitation, *Adjudication procedure, *Industry, *Administrative agencies, Powerplants, Environment, Air pollution, Water pollution, Industrial wastes, Pollution abatement, Regulation, Standards, Permits, Pollutant identification, Federal government, Cities, Legislation, Electric power demand, Nuclear powerplants, Thermal pollution, Water demand, Water users, Water pollution sources.
Identifiers: National Environmental Policy Act.

The considerations counsel for industry should consider before intervening in litigation and what arguments should be used during litigation are discussed in this speech. The primary question counsel for industry must consider is whether to intervene at all. Generally, intervention and subsequent participation in litigation against government agencies is advisable to protect industrial self-interests. During litigation counsel for industry must realize that rarely are the issues involved ones between 'virtue' versus 'vice'. Rather the basic approach of the industry lawyer must be to present his favorable evidence and then to remind the court that it should not interfere with administrative discretion. Reviewing the significance of the National Environmental Policy Act, the author concludes the Act was never intended for judicial review: its lack of criteria, standards, and concrete definitions prevent its effective use as a tool of judicial enforcement. Various methods for dealing with pollution control regulations and quantitative standards are discussed. The suggestion is made that environmental problems will not be solved solely by litigation but that new institutions are needed to resolve disputes concerning the allocation of natural resources. (Rees-Florida)
W72-00474

THE 1971 WATER POLLUTION STUDY FOR THE STATE OF TENNESSEE,
Frank E. Maloney.
The 1971 Water Pollution Study for the State of Tennessee, 1971. 972 p, 4 fig, 106 tab, 1 chart, 116 ref, 56 append.

Descriptors: *Tennessee, *Water pollution control, *Administrative agencies, *Legislation, Water law, Legal aspects, Judicial decisions, Regulation, Standards, State governments, Federal government, Water pollution, Pollution abatement, Local governments, Public health, Administration, Jurisdiction, Administrative decisions, Water quality control, Water quality.

In a study of Tennessee water pollution law conducted by students at Vanderbilt University, the pollution statutes and administrative structures of all fifty states and the federal government were evaluated. A separate appendix deals with the law and regulations of each state, and each section is followed by two charts comparing the law of the state examined with the present and proposed water pollution law of Tennessee. Two sections dealing with federal pollution law discuss the Federal Water Pollution Control Act and recently proposed federal legislation. The study resulted in the drafting of a model water quality act, which was enacted by the Tennessee legislature as the Water Quality Control Act of 1971. A copy of the Act and commentary on it are included. (See also W72-00476 thru W72-00520) (Dye-Florida)
W72-00475

TENNESSEE WATER QUALITY CONTROL ACT OF 1971 WITH COMMENTARY,
F. E. Maloney.
In: The 1971 Water Pollution Study for the State of Tennessee, p 22-77, 1971. 56 p, 1 tab, 116 ref.

Descriptors: *Tennessee, *Legislation, *Adjudication procedure, *Water properties, Legal aspects, Water law, State governments, Administrative agencies, Administration, Water quality control, Water pollution, Standards, Regulation, Permits, Water quality act, Jurisdiction, Water pollution control, Pollution abatement, Judicial decisions, Planning.

This Act establishes a new scheme for the regulation of water quality in Tennessee. The commentary following each subsection describes its particular purpose and often compares the subsection with similar provisions in other states. The Act sets forth the public trust doctrine as state policy and recognizes the right of the people to unpolluted waters. The definition of water pollution is directed toward harmful alteration of the properties of water. A Water Quality Control Board is established with detailed provisions for its membership and duties. The Board's duties include: (1) establishment of standards and a plan for maintenance of state water quality, (2) promulgation of rules and regulations, and (3) judgment of appeals from orders issued by the Commissioner of the Department of Public Health. General responsibility for the administration of the water quality control program is vested in the Department of Health. Permits are required for any alteration of water properties. An adjudicative procedure is set forth for enforcing the provisions of the Act, and it allows appeal to the Board and then to the courts. The Act also provides for penalties and injunctive relief to stop water pollution. (See also W72-00475) (Johnson-Florida)
W72-00476

ALABAMA (ANALYSIS AND COMPARISON WITH TENNESSEE WATER POLLUTION CONTROL LAW),
Frank E. Maloney, and Thomas Buckner.
In: The 1971 Water Pollution Study For The State of Tennessee, Append 3A, 1971. 16 p, 2 tab.

Descriptors: *Alabama, *Pollution abatement, *Administrative agencies, *Water pollution control, Water pollution, Water quality control, Water pollution sources, Standards, Treatment facilities, Administration, Regulation, Institutional constraints, Legislation, Sewage disposal, Industrial wastes, Municipal wastes, Effluent streams, Income, Surveys, Discharge measurement, Legal aspects, Costs, Tennessee.

Provisions of the Alabama Water Pollution Control Act are summarized in order to evaluate its effectiveness in dealing with pollution problems. The organization of the Water Improvement Commission is delineated. The Commission is authorized to conduct stream pollution surveys and establish pollution standards. There is no specific provision giving the commission jurisdiction over quality objectives of sewage systems or over drinking water systems. Procedures of the Commission in enforcing standards and certain remedies and penalties are set forth. The Act is probably adequate in dealing with pollution problems. The size of the Commission is criticized. The employment of receiving water standards is preferred over effluent standards due to their flexibility. The injunctive power should be given to the Commission, along with some provisions for citizen actions in enforcing anti-pollution measures. Suggestions are made for changes in procedures. The punitive damages provision is somewhat unusual and is valuable as a preventive measure and as a source of revenue. A user-surveillance fee is suggested, whereby a non-polluting discharger would bear some of the pollution control cost since he still must be surveyed to insure that he does not start polluting. Two tables compare Alabama law to that of Tennessee. (See also W72-00475) (Smiljanich-Florida)
W72-00477

ALASKA (ANALYSIS AND COMPARISON WITH TENNESSEE WATER LAW),
Frank E. Maloney, and Lewis Laska.
In: The 1971 Water Pollution Study for the State of Tennessee, Append 4, 1971. 20 p, 2 tab.

Descriptors: *Alaska, *Water pollution control, *Water quality control, *Administrative agencies, Water pollution sources, Municipal wastes, Mine wastes, Lumbering, Oil industry, Water law, Prior appropriation, Water utilization, Legislation, Standards, Permits, Regulation, Pollution abatement, Remedies, Legal aspects, Damages, Taxes, Tennessee, Water Quality Act.

Alaska has adopted the prior appropriation doctrine, as codified in the Water Use Act. Under the Water Pollution Control Act, the Department of Health and Welfare administers pollution control policy. This water control agency is examined as to its jurisdiction over specified waters, persons, and pollution and its procedures for classifying waters under seven uses, with a permit system utilizing an effluent standard approach and a financial incentive system to control pollution. Enforcement procedures after findings of violations at public hearings or upon a declaration of emergency are discussed. Violation of the Act constitutes a misdemeanor punishable by fine and imprisonment. The Department may also seek injunctions and liquidated damages. Special interests, includ-

ing the oil and gold mining industries, receive protection. The evaluation concludes that the present law is inadequate for future pollution control since the burden is not placed on the polluter, nor are tax incentives available for pollution treatment facilities. Alaska pollution control law is compared to that of Tennessee through the use of two tables. (See also W72-00475) (Rees-Florida)
W72-00478

ARIZONA (ANALYSIS AND COMPARISON WITH TENNESSEE WATER POLLUTION CONTROL LAW),
Frank E. Maloney, and James McDaniel.
In: The 1971 Water Pollution Study for the State of Tennessee, Append 5, 1971. 13 p, 2 tab.

Descriptors: *Arizona, *Water pollution control, *Water quality, *Project planning, Programs, Project purposes, Water policy, Administrative agencies, Regulation, Permits, Inspection, On-site investigations, Water users, Risks, Damages, Water properties, Water pollution effects, Physical properties, Chemical properties, Biological properties, Public health, Tennessee.

The present status of Arizona water pollution law is analyzed. The Department of Health is the state agency entrusted with the control and abatement of water pollution. This agency has remedial and planning functions and is guided by a State Water Quality Council with a diverse membership of water users. The Council adopts water quality standards and comprehensive programs to prevent and abate pollution, defined as the alteration of physical, chemical, or biological properties of waters. The Council classifies all bodies of water and sets standards for the various classes. To enforce these standards the Council may, after issuing a permit: (1) make inspections and require maintenance of records relating to the operation of disposal systems; (2) compel the polluter to appear before a hearing officer; (3) issue orders summarily, subject to appeal within 20 days; and (4) issue orders without hearings and obtain injunctive relief when a 'clear, present, and immediate changes' in public health is shown. Penalties are as specified for misdemeanors, but no special damages or special penalties for willful violations are allowable. An evaluation offers constructive criticism to strengthen the Council membership and to improve citizen participation. Two tables compare Arizona law to that of Tennessee. (See also W72-00475) (Rees-Florida)
W72-00479

ARKANSAS (ANALYSIS AND COMPARISON WITH TENNESSEE WATER POLLUTION LAW),
Frank E. Maloney, and Edward Gordon.
In: The 1971 Water Pollution Study for the State of Tennessee, Append 6, 1971. 16 p, 1 tab.

Descriptors: *Arkansas, *Water pollution control, *Tennessee, *Evaluation, Water pollution effects, Regulation, Legislation, Administrative agencies, Water law, State governments, Jurisdiction, Legal aspects, Permits, Administration, Inspection, Water pollution, Beneficial use, Waste disposal, Water quality, Standards.

Arkansas water pollution control law is evaluated in this study and contrasted, through the use of tables, with existing and proposed Tennessee water pollution control law. The power to deal with water pollution problems in Arkansas is vested in the Arkansas Pollution Control Commission. The present water pollution control statute was passed in 1965 and is a complete revision of the former law. The Commission is composed of eight members and shares the personnel of other state agencies. A reasonably effective definition of pollution is included in the statute. The Commission is given the power to establish and alter reasonable pollution standards and to set standards of water quality for the waters of the state. A permit is required in order to carry on any of a list of proscribed activities. Any violation of the rules or regulations of the Commission constitutes a misdemeanor. Administrative procedures for enforcing the Commission's standards are enumerated, and judicial review of administrative determinations is provided for. Factors on which the author's evaluation is based include: (1) organization, (2) jurisdiction, (3) procedures, (4) administrative enforcement, (5) remedies and penalties, and (6) judicial review provisions. (See also W72-00475) (Johnson-Florida)
W72-00480

CALIFORNIA (ANALYSIS AND COMPARISON WITH TENNESSEE WATER POLLUTION LAW),
Frank E. Maloney, and Michael Fink.
In: The 1971 Water Pollution Study for the State of Tennessee, Append 7, 1971. 19 p, 2 tab.

Descriptors: *California, *Water pollution control, *Administrative agencies, *Pollution abatement, Water quality control, State governments, Local governments, Administration, Legislation, Legal aspects, Judicial decisions, Financing, Treatment facilities, Sewage disposal, Water resources development, Tennessee, Standards.

California's Water Quality Control Act, which emphasizes treatment of wastes and protection from pollution, privides for a statewide policy-making board and regional boards which enforce the law and establish local policy. Since neither type of board can compel communities to join in establishing sewerage disposal facilities, the preventative approach of compelled unified construction is not within their powers. The boards are charged with controlling pollution, but not specifically with establishing stream standards. Other duties of the boards are described. No provision authorizes classification of waters, charges based on the discharges of polluters, or financial incentives; however, the state board may make loans to public agencies for construction of abatement facilities. Other methods of financing are available. The state board has power to abate nuisances from nonoperating businesses; to enforce discharge requirements, it can inspect facilities and order violators to cease and desist. Additionally, emergency power is available to inspect private facilities. The only administrative review of regional board action is that of the state board. After exhaustion of administrative remedies, an appeal to the courts is allowed. In review, the courts can exercise their independent judgment. Two tables compare California pollution law to the present and proposed law of Tennessee. (See also W72-00457) (Shelnut-Florida)
W72-00481

COLORADO (ANALYSIS AND COMPARISON WITH TENNESSEE WATER POLLUTION LAW),
Frank E. Maloney, and James McDaniel.
In: The 1971 Water Pollution Study for the State of Tennessee, Append 8, 1971. 13 p, 2 tab.

Descriptors: *Colorado, *Water pollution control, *Administration, *Water quality standards, Permits, Inspection, Investigation, Water pollution sources, Waste disposal, Sewage effluents, Septic tanks, Treatment facilities, Administrative agencies, Potable water, Sewage, Biological properties, Chemical properties, Physical properties, Government finance, Damages, Lumbering, Mining, Tennessee.
Identifiers: *Nuisance.

The Colorado water pollution law recognizes water pollution as a public nuisance and asserts control through public policy and the police power. General policy and supervision is handled by an eleven-member commission. The law is basically remedial but contains certain preventive measures with respect to the use of federal loans and the approval of facilities designed to abate pollution. The commission's jurisdiction includes all 'persons' and 'waters' except those in sewage systems and in potable water distribution systems. Pollution includes alteration of any physical, chemical, or biological properties. Waters are classified and standards are set. Standards are enforced by: (1) a permit system for septic tanks, (2) inspection and review of facilities and construction plans, (3) administrative orders demanding abatement of pollution, (4) hearing officers who may make recommendations, and (5) use of injunctions and restraining orders. Violations are misdemeanors punishable by fine up to $2500. Each day is a separate offense, and polluters are liable for fish-kill. No special interests are protected by the law. An evaluation of the law makes recommendations for improvement. Two tables compare Colorado pollution law to that of Tennessee. (See also W72-00475) (Rees-Florida)
W72-00482

FLORIDA (ANALYSIS AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE WATER POLLUTION LAW),
Frank E. Maloney, and James McDaniel.
In: The 1971 Water Pollution Study for the State of Tennessee, Append 11, 1971. 13 p, 2 tab.

Descriptors: *Florida, *Tennessee, *Legislation, *Water pollution control, Standards, Water quality control, Legal aspects, Water law, Administrative agencies, Permits, Regulation, State governments, Administration, Inspection, Water pollution, Pollutants, Jurisdiction, Judicial decisions, Water pollution sources, Evaluation, Pollution abatement.

Water pollution law in Florida is generally enforced by the Department of Air and Water Pollution Control, a distinct state agency. Florida's laws are primarily remedial with some planning functions. The definitions given by the law are generally quite inclusive although the definition of pollution is somewhat limited. The Department is authorized to classify the waters of the state and set water quality standards. Enforcement of the standards is through a permit system, and administrative procedures are provided for enforcement. No time limits are set for enforcement procedures. A maximum fine of $1000 is set for each offense of causing pollution or failing to comply with an order of the Department. Appeal to the courts is available at any time during administrative procedures. This analysis concludes with charts comparing various components of Florida water pollution law with present and proposed Tennessee water pollution laws. (See also W72-00475) (Johnson-Florida)
W72-00483

HAWAII (ANALYSIS AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE WATER POLLUTION LAW),
Frank E. Maloney, and Edward Gordon.
In: The 1971 Water Pollution Study for the State of Tennessee, Append 13, 1971. 15 p, 2 tab.

Descriptors: *Hawaii, *Tennessee, *Evaluation, *Water pollution control, Administrative agencies, Legislation, Legal aspects, Water law, Administration, Regulation, Standards, Water resources, Water pollution, Water quality, Water quality control, Public health, Pollution abatement, Nonstructural alternatives.

Hawaii's water control agency is the Board of Health. The composition and compensation of this Board are specified. Waters are classified in accordance with the uses protected in each class, and changes can be made only after public hearings. Hawaii provides tax deductions for pollution control devices. The Board must approve the establishment or modification of any drainage, sewage, or water supply systems. Any party aggrieved after a ruling by the Board may submit it to the circuit court for review. Hawaii specifies no penalties or administrative remedies for violations of quality standards. Hawaii's water pollution control statute does not apply to anyone engaged strictly in the production and distribution of domestic water or in the establishing, operating, or modification of any

water plant or system for which there is a regularly employed licensed sanitary engineer. The author concludes that the major weaknesses of the Hawaii pollution laws are the lack of a separate body dealing solely with water pollution and the absence of a detailed water pollution statute. Hawaii's law is compared with the existing and proposed water pollution laws of Tennessee. (See also W72-00475) (Robinson-Florida)
W72-00484

INDIANA (ANALYSIS AND COMPARISON WITH TENNESSEE WATER POLLUTION LAW),
Frank E. Maloney, and Michael Fink.
In: The 1971 Water Pollution Study for the State of Tennessee, Append 16, 1971. 17 p, 2 append.

Descriptors: *Indiana, *Water pollution control, *Pollution abatement, *Legislation, Water pollution, Administrative agencies, Water quality control, Water pollution sources, Administration, State goverments, Standards, Permits, Regulation supervisory control (Power), State jurisdiction, Streams, Remedies, Waste disposal, Wastes, Industries, Tennessee, Adjudication procedure, Administrative decisions, Treatment facilities, Legal aspects.

An analysis of the Indiana Stream Pollution Control Act demonstrates that the Act is essentially remedial and belongs to the older class of pollution laws. The organization of the Stream Pollution Control Board is discussed, along with the jurisdiction and procedures of the agency. No permit system is provided for regulation of waste discharges. The Board is empowered to issue orders and promulgate regulations restricting the polluting content of any discharged waste materials. Enforcement remedies available to the Board include criminal penalties for failure to comply with orders. Judicial review of Board actions is available. Evaluation of the Act points to weaknesses in many provisions. There is no statement of policy in the Act to assist the courts in construing its language. The Board is part-time and non-professional in nature, and this unable to cope with the pervasive problem of water pollution in a large industrial state. To effectively prevent pollution, a permit or license system for all discharges is needed. Procedural and remedial inadequacies are criticized. Two tables provide detailed comparisons of the Indiana Act with Tennessee law, present and proposed. (See also W72-00475) (Smiljanich-Florida)
W72-00485

IOWA (ANALYSIS AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE WATER POLLUTION LAW),
Frank E. Maloney, and Robert Leonard.
In: The 1971 Water Pollution Study for the State of Tennessee, Append 17, 1971. 25 p, 2 tab.

Descriptors: *Iowa, *Tennessee, *Evaluations, *Water pollution control, Administrative agencies, Legislation, Legal aspects, Water law, State governments, Regulation, Administration, Administrative decisions, Water pollution, Water quality, Water quality control, Water resources, Pollution abatement, Standards, Permits, Remedies.

Iowa's water pollution control legislation is evaluated in this study in terms of: (1) policy, (2) organization of the water control agency, (3) jurisdiction of the control agency, (4) procedures of the control agency, (5) administrative procedures in enforcing standards, (6) powers of the administrative agent, (7) remedies and penalties, (8) judicial review provisions, and (9) special protected interests. The Iowa Water Pollution Control Commission has authority to establish, modify, and repeal water quality standards. Iowa has no provisions imposing effluent charges, and it does not provide tax deductions for pollution control facilities. Iowa's permit system is described and evaluated by the author. Iowa has no criminal sanctions for violation of its pollution statute, regulations, or orders. It does, however, provide for enjoining such activities and the imposition of a fine for contempt in failing to obey a regulatory order. Iowa's water pollution control law is compared to existing and proposed Tennessee law through the use of a table. The author concludes that the worst drawbacks of the Iowa law are its lack of financial incentives and the inadequate penalty of $100 for each offense. (See also W72-00475) (Robinson-Florida)
W72-00486

KANSAS (ANALYSIS AND COMPARISON OF KANSAS AND TENNESSEE WATER POLLUTION LAW),
Frank E. Maloney, and William Mileham.
In: The 1971 Water Pollution Study for the State of Tennessee, Append 18, 1971. 16 p, 2 tab.

Descriptors: *Kansas, *Water pollution control, *Water quality control, *Administrative agencies, Permits, Regulation, Standards, Sewage disposal, Pollution abatement, Legislation, Judicial decisions, Legal aspects, Administration, State governments, Local governments, Administrative decisions, Tennessee, Water pollution.

The Kansas statutes regulating water quality do not contain a statement of policy regarding water pollution. The State Board of Health, rather than a separate environmental agency, is the designated agency for water quality control. Kansas has established receiving water standards; however, there is no provision for classifying the state's waters. Presently, no financial incentives are provided to reduce the amount of waste discharge. There is no reference to financial hardships as a defense available to municipalities. The combined use of receiving water standards and permit requirements for waste discharges and plant construction results in the ability to abate existing pollution and prevent threatened pollution. The Board is authorized to issue orders to cease pollution. Before an appeal can be taken, the board's determination must be final. The trial or appeal is de novo in nature, and the court can substitute its judgment for that of the Agency. Kansas provides for no exemptions from the Act to particular industries and only a very limited exemption to municipalities. Two tables compare Kansas water pollution law to present and proposed law in Tennessee. (See also W72-00475) (Shelnut-Florida)
W72-00487

KENTUCKY (ANALYSIS AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE WATER POLLUTION LAW),
Frank E. Maloney, and Arnold Rosenfield.
In: The 1971 Water Pollution Study for the State of Tennessee, Append 19, 1971. 18 p, 2 tab.

Descriptors: *Kentucky, *Tennessee, *Evaluations, *Water pollution control, Administration, Regulation, Standards, Administrative decisions, Water law, Legal aspects, Legislation, State governments, Water pollution, Water quality, Water quality control, Pollution abatement, Permits, Administrative agencies.

The Water Pollution Control Act of Kentucky sets up a Water Pollution Control Commission which is the administrative and enforcement agent of the state. This study evaluates the Kentucky Act in terms of: (1) its general approach, (2) organization of the Water Control Agency, (3) jurisdiction of the control agency, (4) procedures of the control agency, (5) administrative procedures in enforcing standards, (6) powers and duties of the administrative agent, (7) remedies and penalties, (8) judicial review provisions, and (9) special interests protected. The Kentucky Water Pollution Control Commission has the power to set water standards, control pollutant discharges, set standards for sewage systems, and control drinking water systems. There are no financial statutory incentives to control pollution. Kentucky requires permits for the construction or modification of waste outlets, disposal systems, and other establishments whose operation might cause a substantial increase in waste discharges. A permit is necessary to discharge wastes into state waters. The Kentucky Act is not comprehensive and requires additional legislative strengthening. The Act is also contrasted, in detail, to present and proposed Tennessee law. (See also W72-00475) (Robinson-Florida)
W72-00488

LOUISIANA (ANALYSIS OF STATE'S WATER POLLUTION LAW AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE LAW),
Frank E. Maloney, and Edward Gorden.
In: The 1971 Water Pollution Study for the State of Tennessee, Append 20, 1971. 18 p, 2 tab.

Descriptors: *Louisiana, *Water pollution control, *Administrative agencies, *Pollution abatement, Water quality control, Federal government, State governments, Legislation, Legal aspects, Permits, Standards, Administration, Waste disposal, Water utilization, Judicial decisions, Tennessee, Water pollution.

The power to control water quality in Louisiana is vested in the Stream Control Commission, which is given broad discretionary power. The Commission is presently composed of other state department heads or their representatives. The statute does not provide for an executive secretary to administer the law. Furthermore, no provision is made for funding the Commission; staffing is done through other state agencies. Assuming the appropriate manpower, the Commission must act as a body in all decisions. It has authority to set standards in accord with the water's public use, volume flow, and high and low water marks affected by waste disposal; discharges which are unreasonable and against the public interest are prohibited. No distinction is noted between effluent and receiving water standards. The Commission can require certification of applicants for federal licenses or permits. It has permit authority and has authority to enter property for inspection. Additionally, the Commission can issue temporary orders in emergency situations. An aggrieved person may request a hearing; the Commission fixes the time and place and notifies the complainant. The statute provides for both civil and criminal sanctions. Two tables compare Louisiana pollution control law with present and proposed Tennessee law. (See also W72-00475) (Shelnut-Florida)
W72-00489

MAINE (ANALYSIS OF STATE'S WATER POLLUTION LAW AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE LAW),
Frank E. Maloney, and Michael Fink.
In: The 1971 Water Pollution Study for the State of Tennessee, Append 21, 1971. 18 p, 2 tab.

Descriptors: *Maine, *Water pollution control, *Administrative agencies, *Pollution abatement, Water quality control, Federal government, State governments, Local governments, Legal aspects, Legislation, Judicial decisions, Standards, Permits, Administration, Waste disposal, Tennessee, Water pollution.

Maine's pollution control law seeks to integrate the protection of air and water quality with site development. The statute enumerates standards for water classification. There are no provisions in the act for charges based on discharges, but pollution abatement facilities are exempted from sales and use taxes. Additionally, funds may be granted to local and regional entities for planning and construction of abatement facilities. The Environmental Improvement Commission is authorized to award grants for the construction of municipal pollution abatement facilities which have received federal approval and funds. An oil discharge prevention subchapter provides for issuance of emergency orders by the Commission. The Commission may grant discharge permits where the quality of classified waters will not be lowered. It

may also establish a mixing zone to determine the effects of discharges in connection with the granting of a license. Violators of the statute are subject to fine and are liable for costs actually incurred in tracing the source and eliminating the effects of pollution. Additionally, the attorney general may institute injunction proceedings. There is no administrative review of board determinations. Appeals are taken at a trial de novo. Two tables compare Maine Pollution control law to present and proposed Tennessee law. (See also W72-00475) (Shelnut-Florida)
W72-00490

MARYLAND (ANALYSIS OF MARYLAND WATER POLLUTION LAW AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE LAW),
Frank E. Maloney, and David Dawson.
In: The 1971 Water Pollution Study for the State of Tennessee, Append 22, 1971. 17 p, 2 tab, 2 ref.

Descriptors: *Maryland, *Tennessee, *Pollution abatement, *Water pollution control, Water pollution, Water quality, Water quality control, Legislation, Legal aspects, Administrative agencies, Remedies, Planning, Wastes, Waste disposal, Environmental sanitation, Standards, Investigations, Analysis.

The Maryland water pollution abatement law is generally analyzed by the author, who then makes a detailed comparison of the law with present and proposed Tennessee law. The Maryland law is a modern and comprehensive pollution control law which combines both a preventive and remedial approach with the planning and implementation efforts of the Maryland Environmental Service. The following aspects of the Maryland law are generally discussed: (1) the organization of the Water Resources Commission; (2) the people, waters, types of pollution and wastes, and treatment works and disposal systems within the statute's perview; (3) procedures of the Department of Water Resources; (4) administrative procedures in enforcing standards; (5) the powers and duties of the Department of Water Resources; (6) remedies and penalties; (7) procedures for judicial review; and (8) an overall evaluation of the statute. In his evaluation, the author states that the Maryland statute provides the necessary authority and procedures for the prevention and control of pollution and the improvement of water quality within the state. (See also W72-00475) (Gallagher-Florida)
W72-00491

MASSACHUSETTS (ANALYSIS OF STATE WATER POLLUTION LAW AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE LAW),
Frank E. Maloney, and William Blanchard.
In: The 1971 Water Pollution Study for the State of Tennessee, Append 23, 1971. 16 p, 2 tab.

Descriptors: *Massachusetts, *Water pollution control, *Administrative agencies, *Regulation, Oil wastes, Water quality control, Permits, Financing, Grants, Government finance, Legislation, Legal aspects, Judicial decisions, Pollution abatement, Standards, Administration, State governments, Local governments, Tennessee.

Massachusetts' basic policy is to provide funds, plans, and inspection of various local districts responsible for providing pollution control facilities. The main thrust of the law is to maintain minimum statewide standards, while allowing each local area to determine what pollution abatement facilities are necessary. The act's stronger provisions concern protecting the coast from oil spillage. A division of water pollution control is created. It is to adopt water quality standards, and this involves classifying the various waters. Financial incentives include assistance to municipalities or districts in improving abatement facilities, application for state and federal grants to develop comprehensive abatement plans, and the establishment of a clean waters scholarship intern program. Each district is authorized to issue bonds. The usual means of administrative enforcement are employed, such as the entrance onto land for inspection and the issuance of orders and permits. Violators of the regulations are subject to fine and injunction. The act does not call for any other assessment of damages. No citizen actions are specified. All determinations of the division are subject to judicial review after exhaustion of administrative remedies. Two tables provide comparison with Tennessee law. (See also W72-00475) (Shelnut-Florida)
W72-00492

MICHIGAN (ANALYSIS OF WATER POLLUTION LAW AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE LAW),
Frank E. Maloney, and William Mileham.
In: The 1971 Water Pollution Study for the State of Tennessee, Append 24, 1971. 17 p, 2 tab.

Descriptors: *Michigan, *Water pollution control, *Administrative agencies, *Standards, Water quality control, Financing, State governments, Federal government, Legislation, Legal aspects, Judicial decisions, Permits, Effluents, Administration, Water resources development, Pollution abatement, Tennessee, Water pollution, Administrative decisions, Damages, Remedies.

Three separate acts control Michigan's water quality. The water resources commission, which is an independent body, has no express authority to establish water classifications, but may establish pollution standards for the state's waters in relation to their respective uses. Both effluent and receiving water standards are utilized. As a financial incentive, the commission can distribute to municipalities funds made available by the state and federal government for construction of treatment works. The commission possesses the usual powers of entry onto lands and inspection; it may also certify persons as qualified to operate water treatment facilities. In the issuance of orders, the commission will issue a proposed form of the order, automatically scheduling a subsequent hearing. Following the hearing the order will be deemed conclusive. Any offender is not only guilty of a misdemeanor, but is liable for the value of the injuries done to natural resources. The appeal process limits the court's review to determining whether the administrative decision is supported by substantial evidence. Municipalities are statutorily exempted from commission control, but are still subject to suit by the attorney general. Two tables compare water pollution control law in Michigan to that of Tennessee, both present and proposed. (See also W72-00475) (Shelnut-Florida)
W72-00493

MINNESOTA (ANALYSIS OF STATE'S WATER POLLUTION LAW AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE LAW),
Frank E. Maloney, and Thomas Buckner.
In: The 1971 Water Pollution Study for the State of Tennessee, Append 25, 1971. 17 p, 2 tab.

Descriptors: *Minnesota, *Water pollution control, *Administrative agencies, *Regulation, State governments, Local governments, Water resources development, Legislation, Legal aspects, Water quality control, Standards, Financing, Judicial decisions, Effluents, Sewage disposal, Pollution abatement, Administration, Tennessee.

The Minnesota water pollution control act provides for a water control agency and a pollution control advisory committee with liaison and publicity functions. The agency is required to establish standards for the state's waters in relation to their public use. Additionally, it has the duty to make orders requiring discontinuance of the discharge of sewage, industrial wastes, or other wastes into any waters where the result would be pollution in excess of applicable standards. The act employs receiving water standards, rather than effluent criteria. No types of financial incentives are provided. The state's waters may be classified if it is deemed advisable. A permit is required before construction or operation of a disposal system. Other administrative procedures for enforcing standards are enumerated. Violation of the law or any regulation constitutes a misdemeanor. Pollution of any water is a public nuisance and may be enjoined. No provision is made for damages or citizen actions. Appeal is to the courts from any agency determination; however, the act makes no provision for appeal from the judicial review of a determination of the agency. Two tables compare Minnesota pollution control law with the present and proposed law of Tennessee. (See also W72-00475) (Shelnut-Florida)
W72-00494

MISSISSIPPI (ANALYSIS OF STATE WATER POLLUTION LAW AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE LAW),
Frank E. Maloney, and William Blanchard.
In: The 1971 Water Pollution Study for the State of Tennessee, Append 26, 1971. 18 p, 2 tab.

Descriptors: *Mississippi, *Tennessee, *Water pollution control, *Evaluation, Pollution abatement, Standards, Inspection, Permits, Water quality control, State governments, State jurisdiction, Administrative agencies, Supervisory control (Power), Water policy, Water conservation, Remedies, Waste treatment, Sewage treatment, Water pollution sources, Project planning, Water supply, Public health.

This article analyzes the Mississippi Air and Water Pollution Control statute and compares it with present and proposed Tennessee water pollution law. The Mississippi statute is deemed a comprehensive modern statute. Although it combines air and water pollution control in one bill, these sections are easily distinguishable. The law is broadly drafted and covers every way in which the public and private waters of the state can be rendered harmful, detrimental, or injurious to the public's enjoyment or employment. Mississippi's statute declares that pollution is a menace to public health and welfare, creates a public nuisance, is harmful to wildlife, and impairs legitimate beneficial uses. The public policy of Mississippi is declared to be to conserve, protect, maintain, and improve state waters. The article analyzes the statute in the following areas: (1) organization of the water control agency, (2) jurisdiction of the agency, (3) procedures of the agency, (4) administrative procedures in enforcing standards, (5) powers and duties of the administrative agent, (6) remedies and penalties, (7) judicial review, (8) special interests protected or exempted, and (9) evaluation and comment on the Mississippi statute. (See also W72-00475) (Horwitz-Florida)
W72-00495

MONTANA (ANALYSIS OF STATE WATER POLLUTION LAW AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE LAW),
Frank E. Maloney, and Thomas Spieczny.
In: The 1971 Water Pollution Study for the State of Tennessee, Append 28, 1971. 16 p, 2 tab.

Descriptors: *Montana, *Regulation, *Water pollution control, *Tennessee, Administration, Pollution abatement, Standards, Inspection, Permits, Water quality control, State governments, State jurisdiction, Administrative agencies, Supervisory power, Water policy, Water conservation, Remedies, Waste treatment, Sewage treatment, Water pollution sources, Legal aspects, Project planning, Water resources, Water supply, Public health.

This article analyzes the Montana water pollution statute and, by the use of tables and charts, compares the statute with present and proposed Tennessee water pollution law. The Montana approach to water pollution control is deemed to be fundamentally the same as that of Tennessee. There is an

express twofold statement of public policy to conserve, protect, and improve the quality of water and to provide a basic plan for the prevention, abatement, and control of water pollution. The statute is considered fairly modern, having been enacted in 1967. The article analyzes the statute by considering: (1) the organization of the Water Pollution Control Council; (2) the jurisdiction of the Council, which extends over all waters within the state and to all persons; (3) procedures of the Council in establishing water classifications and standards; (4) administrative procedures in enforcing standards, accomplished mainly through a permit system; (5) the absence of statutory provisions concerning powers of the administrative agent; (6) remedies and penalties; and (7) judicial review of administrative determinations. (See also W72-00457) (Horwitz-Florida)
W72-00496

NEBRASKA (ANALYSIS OF STATE'S WATER POLLUTION LAW AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE LAW),
Frank E. Maloney, and Edward Gordon.
In: The 1971 Water Pollution Study for the State of Tennessee, Append 29, 1971. 16 p, 2 tab.

Descriptors: *Nebraska, *Water pollution control, *Administrative agencies, *Standards, Water quality control, Pollution abatement, Permits, Remedies, Damages, Judicial decisions, Legislation, Legal aspects, Water supply, Sewage disposal, Treatment facilities, State governments, Local governments, Grants, Administration, Tennessee.

The power to control the quality of Nebraska's waters is vested in the State Water Pollution Control Council. The Council is heavily weighted with governmental agency officials and representatives from industry and municipalities. The Council's jurisdiction is described. General, primarily subjective, standards guide the Council in its execution of water quality standards. The statute does not specifically refer to the quality standards for sewage systems. Drinking water systems come within the Council's jurisdiction through its jurisdiction over treatment facilities. Procedures for classifying state waters, as well as notice of hearings, are set forth. Permit charges must be geared to the amount of discharge. The Council has authority to administer state grants and to cooperate with other governmental agencies to execute the law. It has emergency power to issue immediately effective orders and to enter land for investigatory purposes and to issue orders. Violators are subject to fines and are liable for damages. An injunction may be issued even though an adequate remedy at law exists. In the appeal process, a sixty-day delay is permitted over and above the thirty-day grace period. Two tables compare Nebraska pollution control law to the present and proposed law of Tennessee. (See also W72-00475) (Shelnut-Florida)
W72-00497

NEVADA (ANALYSIS OF STATE WATER POLLUTION LAW AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE LAW),
Frank E. Maloney, and Jon Heaton.
In: The 1971 Water Pollution Study for the State of Tennessee, Append 30, 1971. 19 p, 2 tab.

Descriptors: *Nevada, *Water pollution control, *Administrative agencies, *Pollution abatement, Boats, Sewage disposal, State governments, Legislation, Judicial decisions, Legal aspects, Political aspects, Water supply, Permits, Federal government, Tennessee, Administration.

The state board of health is supreme in all non-administrative health matters and includes within its area of control the water pollution problem. Water pollution matters, however, are but a samll part of the area of its interest. In defining potential polluters, Nevada law does not specifically include either the state or federal governments, creating a serious gap in coverage. Administrative procedures for water pollution control are essentially nonexistent. There is no classification of water, standards for streams or effluents, or financial incentives to aid in pollution control. Procedures are established for the inspection and control of water supply systems. No permit system is used for the state as a whole; however, as concerns the Lake Tahoe watershed, permits must be issued prior to construction of any building or water or sewage system. All enforcement of the water pollution laws is by judicial action initiated by the attorney general. The board of health has no enforcement powers. Pollution of state waters constitutes a misdemeanor. Strict controls are placed upon boat owners. Two tables compare Nevada pollution control law to the present and proposed law of Tennessee. (See also W72-00475) (Shelnut-Florida)
W72-00498

NEW HAMPSHIRE (ANALYSIS OF STATE WATER POLLUTION LAW AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE LAW),
Frank E. Maloney, and William Mileham.
In: The 1971 Water Pollution Study for the State of Tennessee, Append 31, 1971. 17 p, 2 tab.

Descriptors: *New Hampshire, *Tennessee, *Water pollution control, *Administration, Legislation, Regulation, State governments, Administrative agencies, Legal aspects, Pollution abatement, Waste water treatment, Treatment facilities, Sewage treatment, Water conservation, Water control, Water permits, Water policy, Water pollution, Water pollution treatment, Water pollution sources, Inspection, Standards.

This article examines and evaluates the present water pollution control legislation of New Hampshire and compares it to the present and proposed Tennessee law on water pollution. All major aspects of the New Hampshire statute are investigated, including: (1) statement of policy and general approach to the water pollution problem, (2) organization of the water control agency, (3) jurisdiction of the agency, (4) procedures of the water control agency, (5) administrative procedures in enforcing standards, (6) powers of the administrative agent, (7) remedies and penalties, (8) judicial review of administrative determinations, and (9) special interests protected or exempted. A concise evaluation of each area of the law is presented. The objective of the statute is the prevention of pollution at its inception rather than emphasis on action after it has occurred. The only fault with the stated policy is that the need for such legislation is described in terms of protecting the water supplies for domestic use rather than a broader classification which should include all purposes. The weakest point in the statute is deemed the provision which allows up to five years to abate pollution. (See also W72-00475) (Horwitz-Florida)
W72-00499

NEW JERSEY (ANALYSIS OF STATE'S WATER POLLUTION LAW AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE LAW),
Frank E. Maloney, and Thomas Spieczny.
In: The 1971 Water Pollution Study for the State of Tennessee, Append 32, 1971. 17 p, 2 tab.

Descriptors: *New Jersey, *Tennessee, *Water pollution control, *Water quality control, Regulation, Administration, Administrative agencies, Water pollution, Water quality, Pollution abatement, Water policy, Permits, Legislation, Water law, Legal aspects, State governments, Public health, Grants, Loans, Sewage treatment, Water purification.

The membership, organization and terms of office of the New Jersey Clean Water Council are set forth. There is no statutory authority for the Council or the Department of Health to classify waters or establish purity standards. Grants may be made for the construction of pollution control projects. New Jersey provides tax inducements for the installation of pollution control devices and facilities and for sewage treatment facilities. Permits are required for the operation, construction, or alteration of sewage treatment and water purification plants. The administrative agent is the commissioner of health. The various procedures for assessing penalties are explained. Administrative review is very limited and there are no provisions for judicial review of any administrative decision. New Jersey has a poorly organized and repetitious collection of statutes rather than a comprehensive water pollution control act. There is a need for a delegation of authority because all regulation and enforcement must be done by the Department of Health. Technical water problems could best be handled by an independent agency. There is also a need for more administrative review. New Jersey water law is compared to that of Tennessee by the use of two tables. (See also W72-00475) (Robinson-Florida)
W72-00500

NEW MEXICO (ANALYSIS OF STATE WATER POLLUTION LAW AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE LAW),
Frank E. Maloney, and Jon Heaton.
In: The 1971 Water Pollution Study for the State of Tennessee, Append 33, 1971. 19 p, 2 tab.

Descriptors: *New Mexico, *Water pollution control, *Regulation, *Administration, Pollution abatement, State governments, State jurisdiction, Administrative agencies, Standards, Permits, Inspection, Political aspects, Water pollution sources, Legal aspects, Remedies, Water pollution, Water quality control, Public health, Legislation, Water rights, Project planning, Supervisory control (Power), Tennessee.

The New Mexico water quality law is analyzed and compared to the present and proposed Tennessee pollution law. The bulk of the New Mexico law was enacted in 1967, with extensive modification in 1970. In spite of the law's recent birth its approach to water control problems is ancient. The law initially appears to be a well written statute, but careful study reveals weaknesses in nearly all phases of operation. The administrative board is an impotent conglomerate of various state agency heads, making political control dominant. There is no administrative enforcement of the act and what little power the law gives is exercised by constituent state agencies over which the board has little control. The entire act seems to be written with an eye toward protecting vested interests. The law is analyzed by considering the following areas: (1) organization of the water control agency, (2) jurisdiction, (3) procedures, (4) administrative procedures in enforcing standards, (5) powers and duties of administrative agent, (6) remedies and penalties, (7) judicial review of administrative determinations, and (8) special interests protected or exempted. (See also W72-00475) (Horwitz-Florida)
W72-00501

NEW YORK (ANALYSIS OF STATE'S WATER POLLUTION LAW AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE LAW),
F. E. Maloney, and Richard Jarashow.
In: The 1971 Water Pollution Study for the State of Tennessee, Append 34, 1971. 16 p, 2 tab.

Descriptors: *New York, *Water pollution control, *Pollution abatement, *Water quality control, Administrative agencies, Public health, Water pollution, Water policy, Water quality, Standards, Permits, Classification, Inspection, On-site investigation, Water users, Water utilization, Streams, Waste treatment, Water pollution treatment, Industries, Fish, Shellfish, Damages, Remedies.

New York law serves to prevent new pollution and to abate existing pollution. The Department of Health is the enforcement agency; the Water Resources Commission promulgates standards, classifies state waters, and reviews determinations

of the Commissioner of Health. These agencies act in the interests of public health to protect persons and animals. New York law is examined regarding: (1) organization of the Water Resources Commission, (2) jurisdiction of the Water Resources Commission, (3) procedures to classify waters, (4) administrative procedures in enforcing standards, (5) remedies and penalties, (6) judicial review, (7) special interest exemptions, and (8) a concise evaluation. The author concludes that the structure of the Water Resources Commission is somewhat too large and inefficient. Another basic problem is that the law's structure engenders much delay before recognized pollution is brought under control. Orders must await a public hearing, and the appeals process is lengthy. The civil and criminal penalties may not be a strong enough deterrent. There is no provision for the initiation of citizen complaints. Two good aspects of the law are the non-recognition of financial hardship exceptions and the issuance of certificates of compliance for purposes of realty tax exemptions. (See also W72-00475) (Rees-Florida)
W72-00502

NORTH DAKOTA (ANALYSIS OF STATE'S WATER POLLUTION LAW AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE LAW),
Frank E. Maloney, and Thomas Buckner.
In: The 1971 Water Pollution Study for the State of Tennessee, Append 36, 1971. 17 p, 2 tab.

Descriptors: *North Dakota, *Water pollution control, *Pollution abatement, *Administration, Water quality control, Water pollution treatment, Water pollution sources, Administrative agencies, Permits, Regulation, Waste disposal, Sewage disposal, Waste treatment, Treatment facilities, Supervisory control (Power), Legislation, State jurisdiction, Remedies, Industrial wastes, Legal aspects, Domestic water, Tennessee.

The North Dakota Water Pollution Act is analyzed. The Act is brief and declares that it is in the public interest to protect and improve water quality for domestic, industrial, and recreational uses. The State Water Pollution Control Board is the chief water control agency. The composition and procedures of the Board are set forth. The Board has jurisdiction to set stream standards, but is not specifically given jurisdiction over wastes that constitute pollution. The State Department of Health also exercises certain pollution control powers. There is no formal permit system, but prior approval must be obtained before the volume of waste discharge is materially increased. Remedies and penalties prescribed in the Act are described. The Act is criticized as being unnecessarily short and vague in parts. There should be provision for citizen suits, and the Board should be given the right to maintain actions for damages for fish and game killed by pollution. Administrative and judicial review is simplified through use of a standard procedure for all state agencies. Specific changes in the composition of the Board are suggested. Two tables provide comparison with Tennessee law. (See also W72-00475) (Smiljanich-Florida)
W72-00503

OHIO (ANALYSIS OF STATE'S WATER POLLUTION LAW AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE LAW),
Frank E. Maloney, and Robert Leonard.
In: The 1971 Water Pollution Study for the State of Tennessee, Append 37, 1971. 26 p, 2 tab.

Descriptors: *Ohio, *Water pollution control, *Legislation, *Administrative agencies, Water pollution, Water pollution sources, Water pollution treatment, Water pollution effects, Water quality, Water quality control, Standards, Treatment facilities, Legal aspects, Permits, Administrative decisions, Financing, Industry, State governments, Local governments, Sewage disposal, Pollution abatement, Remedies.

Ohio's Water Pollution Control Act created a Water Pollution Control Board with administrative, regulatory, and quasi-judicial powers. The Board may develop programs for the prevention, control, and abatement of water pollution, and can require construction or modification of waste disposal systems. It may bar local governments from making further connections to inadequate sewerage systems, pending improvements. If industry refuses to respond to improvement orders, the Board may secure injunctive relief to support its cease and desist order. Permit-orders for waste discharges are issued by the Board, and permits are renewed only when pollution abatement progress is shown. Lack of progress or poor operation of facilities results in formal hearings and legal action by the Board. Water quality standards specify water uses to be protected, the required water quality for each use, and implementation procedures designed to attain this quality. Entities discharging wastes must adhere to these standards. The Act also grants restricted financial incentives for construction of industrial water pollution control facilities. Attempts should be made to provide financial incentives to other entities for pollution control, and to enact a precise policy statement for the protection of environmental resources. (See also W72-00475) (Hart-Florida)
W72-00504

OKLAHOMA (ANALYSIS OF STATE WATER POLLUTION LAW AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE LAW),
Frank E. Maloney, and Richard Jarashow.
In: The 1971 Water Pollution Study for the State of Tennessee, Append 38, 1971. 15 p, 2 tab.

Descriptors: *Oklahoma, *Water pollution control, *Administrative agencies, *Water quality control, Pollution abatement, Sewage disposal, Permits, Standards, State governments, Legislation, Judicial decisions, Adjudication procedures, Administration, Remedies, Damages, Regulation, Coordination, Water supply, Tennessee.

The present Oklahoma law is a modern type of pollution control statute. The Department of Pollution Control was established as an integrated environmental agency. The pollution Control Coordinating Board is the primary coordinating agent, while the Department of Health and other administrative agencies are initially responsible for enforcement. The law emphasizes the preventive nature of their work. The Department has jurisdiction to set quality standards for sewage systems and public water supplies. The Board establishes stream standards and classifies the state's waters. The standard for determining the existence of pollution is based upon a determination that a discharge into the water reduces the quality below minimum quality standards. A permit system is utilized. There is no statutory right to enter land to make inspections. Emergency orders may be issued. The only apparatus for administrative review is through the Board. The willful violation of the law constitutes a misdemeanor. Injunctive relief is available only where there is no adequate remedy at law. Violators are also liable for damages. Judicial review is permitted only after exhaustion of administrative remedies. The law does not provide for citizen actions nor for investigatory process by the agency. Two tables provide comparisons with present and proposed Tennessee law. (See also W72-00475) (Shelnut-Florida)
W72-00505

OREGON (ANALYSIS OF STATE WATER POLLUTION LAW AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE LAW),
Frank E. Maloney, and Lewis Laska.
In: The 1971 Water Pollution Study for the State of Tennessee, Append 39, 1971. 20 p, 2 tab.

Descriptors: *Oregon, *Water pollution control, *Pollution abatement, *Water quality control, Water pollution, Legislation, Administrative agencies, Water pollution sources, Treatment facilities, Regulation, Administration, Sewage disposal, Water pollution treatment, Permits, Waste disposal, Septic tanks, Standards, Tennessee, State jurisdiction, Sewage disposal, Sewers, Legal aspects.

A review of Oregon water pollution demonstrates its overall adequacy. A large body of statutes deals with the use and protection of water. The Environmental Quality Commission is the chief water pollution control agency. The organization, procedures, and jurisdiction of the Commission are outlined. The Commission has the authority to establish water quality standards, enforce orders of various departments, and review construction plans for sewage systems. Jurisdiction over domestic water rests in the State Board of Health. Water pollution is prohibited and constitutes a nuisance per se. All waste water or sewage must be discharged into a sewer system, septic tank system, or other approved disposal system. Any waste discharge into waters is prohibited unless a permit is obtained. Stringent criminal penalties are provided. Polluters are liable to the state for restoration of fish and wildlife injured by pollution. The legislation is criticized for its lack of a provision for citizen suits and for the unclear organization of the Commission. The administrative process is commended as part of a workable pattern for enforcement. Two tables provide comparisons with present and proposed Tennessee law. (See also W72-00475) (Smiljanich-Florida)
W72-00506

PENNSYLVANIA (ANALYSIS OF STATE WATER POLLUTION LAW AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE LAW),
Frank E. Maloney, and Richard Jarashow.
In: The 1971 Water Pollution Study for the State of Tennessee, Append 40, 1971. 16 p, 2 tab.

Descriptors: *Pennsylvania, *Tennessee, *Water pollution control, *Water quality control, Administrative agencies, Standards, Permits, Legislation, Legal aspects, Judicial decisions, Effluents, Sewage disposal, State governments, Local governments, Administration, Damages, Regulation, Evaluation.

Pennsylvania law recognizes both the remedial and preventive aspects of water pollution control. It establishes the Environmental Quality Board and the Department of Environmental Resources. The former is the policy-making body, while the latter is the enforcement arm. The Board is authorized to classify waters and to set stream standards. It considers both effluent and receiving water standards in examining pollution. The Board is empowered to conduct inspections in addition to utilizing a permit system. The Department may issue enforcement orders, but it does not have authority to issue emergency orders. Every person discharging wastes into state waters must file certain information with the Board. Penalties are imposed for the failure to file. A hearing board shall review any action of the Department. Violators are guilty of a summary offense punishable by fine. The Board may also impose a civil penalty. The law incorporates the Pennsylvania Administrative Agency law to determine the scope of judicial review. Municipalities are not subject to suit if they retain a permit. This evaluation concludes with a comparison of Pennsylvania law with existing and proposed Tennessee water pollution law. (See also W72-00475) (Shelnut-Florida)
W72-00507

RHODE ISLAND (ANALYSIS OF STATE WATER POLLUTION LAW AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE LAW),
Frank E. Maloney, and William Blanchard.
In: The 1971 Water Pollution Study for the State of Tennessee, Append 41, 1971. 17 p, 2 tab.

Descriptors: *Rhode Island, *Water pollution control, *Evaluation, *Tennessee, Administration, Regulation, Permits, Standards, Inspection,

Remedies, Pollution abatement, State governments, State jurisdiction, Administrative agencies, Supervisory control (Power), Water policy, Water quality control, Treatment facilities, Water pollution sources, Legal aspects, Waste water disposal, Waste treatment, Water resources.

The Rhode Island pollution control law is evaluated in this study and compared with present and proposed Tennessee law through the use of tables. The Rhode Island law is primarily an attempt to regulate all means by which injurious foreign substances may enter the waters of the state. There is no stated policy or purpose. The law defines what constitutes pollution and seeks to alleviate it by authorizing various sanctions, fines, and injunctive relief. The law also looks to the future preservation of water quality by authorizing plans and prescribing standards. The Director of Health is the key administrator and is in charge of enforcing the act, while a water pollution board serves in an advisory capacity to the Director. The study analyzes the Rhode Island law in the following areas: (1) organization of the water control agency, (2) jurisdiction of the agency, (3) procedures of the agency, (4) administrative procedures in enforcing standards, (5) powers and duties of the administrative agent, (6) remedies and penalties, (7) judicial review, and (8) special interests protected or exempted. (See also W72-00475) (Horwitz-Florida)
W72-00508

SOUTH CAROLINA (ANALYSIS OF STATE WATER POLLUTION LAW AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE LAW),
Frank E. Maloney, and Thomas Speiczny.
In: The 1971 Water Pollution Study for the State of Tennessee, Append 42, 1971. 17 p, 2 tab.

Descriptors: *South Carolina, *Water pollution control, *Evaluation, *Tennessee, Administration, Regulation, Permits, Standards, Inspection, Remedies, Pollution abatement, State governments, State jurisdiction, Administrative agencies, Supervisory control (Power), Water policy, Water quality control, Treatment facilities, Water pollution sources, Legal aspects, Waste water disposal, Waste treatment, Water resources.

South Carolina pollution control law is evaluated in this study and compared with present and proposed Tennessee law, through the use of various tables. South Carolina's general approach to pollution control is deemed quite comprehensive. It deals with both air and water pollution under the same statute. The statement of policy of the pollution control law is moderate. It declares that the public policy of the state requires the maintenance of resasonable air and water purity standards consistent with both maximum employment and industrial development. There is no reference to water being held in a public trust. South Carolina's Water Pollution Control Authority is composed of thirteen members. This is considered too large for maximum efficiency. The jurisdiction of the Authority extends over all state waters and the Atlantic Ocean and its inland extensions. Also evaluated by this study are provisions dealing with: (1) procedures of the water control authority, (2) administrative procedures in enforcing authority standards, (3) powers and duties of the administrative agent, (4) remedies and penalties, (5) judicial review of administrative determinations, and (6) special interests protected or exempted. (See also W72-00475) (Horwitz-Florida)
W72-00509

SOUTH DAKOTA (ANALYSIS OF STATE'S WATER POLLUTION LAW AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE LAW),
Frank E. Maloney, and Arnold Rosenfield.
In: The 1971 Water Pollution Study for the State of Tennessee, Append 43, 1971. 16 p, 2 tab.

Descriptors: *South Dakota, *Tennessee, *Water pollution control, *Water quality control, Administrative agencies, Standards, Regulation, State governments, Legislation, Legal aspects, Sewage disposal, Damages, Administration, Political aspects, Permits, Evaluation.

South Dakota law does not appear to offer much in the way of effective water pollution control. This may be due to the fact that the state has not had to deal with the problems that confront an industrialized, populated state. South Dakota has, however, established a Committee on Water Pollution. The law reflects concern for pollution resulting from agriculture, but agriculture is well represented on the Committee. This creates a potential conflict of interest. The Committee's job is to classify state waters into two classes. Class A waters are under pollution control, and Class B waters are considered more important as carriers of waste. The Committee is empowered to set quality standards but not to offer financial incentives. A permit is required before discharging new pollution into Class A waters. No specific authority is given to investigate or inspect except in regards to permits. The law provides specifically for the issuance of regulatory orders but not for emergency authority. Violators are subject to light penalties and are liable for damages. This evaluation concludes with a comparison of South Dakota law with existing and proposed Tennessee law. (See also W72-00475) (Shelnut-Florida)
W72-00510

UTAH (ANALYSIS OF STATE WATER POLLUTION LAW AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE LAW),
Frank E. Maloney, and Jon Heaton.
In: The 1971 Water Pollution Study for the State of Tennessee, Append 45, 1971. 17 p, 2 tab.

Descriptors: *Utah, *Regulations, *Water pollution control, *Administration, Administrative agencies, State governments, State jurisdiction, Standards, Inspection, Legislation, Legal aspects, Pollution abatement, Water policy, Water pollution, Water quality control, Water quality, Supervisory control, Water resources development, Water pollution treatment, Water conservation, Waste water disposal, Waste water treatment, Permits, Public health.

The Utah Water Pollution Control Act is analyzed and compared to the Tennessee water pollution law. The introduction and survey of Utah's general approach of the water pollution problem examines the purpose of the law and notes that it is modeled closely after the Suggested State Water Pollution Control Act of the Department of Health, Education and Welfare. The organization of the water control agency is considered. The jurisdiction of the water control agency includes control over all waters within the state, with the notable exception of waters entirely within private property. The procedures of the water control agency are presented, with emphasis on its duty of developing a comprehensive program for the prevention and control of pollution, including standards of quality. The article then considers the administrative procedures utilized in enforcing standards of water quality, which include inspection to detect violations and hearings on any violations. The remedies and penalties of the law are next considered, along with the availability of judicial review of administrative determinations. An admirable feature of this law is deemed to be that no special interests are protected or exempted. (See also W72-00475) (Horwitz-Florida)
W72-00511

VERMONT (ANALYSIS OF STATE WATER POLLUTION LAW AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE LAW),
Frank E. Maloney, and Michael Fink.
In: The 1971 Water Pollution Study for the State of Tennessee, Append 46, 1971. 19 p, 2 tab.

Descriptors: *Vermont, *Regulation, *Water pollution control, *Administration, Tennessee, Pollution abatement, State governments, State jurisdiction, Administrative agencies, Standards, Inspection, Permits, Water quality control, Supervisory control (Power), Water policy, Water conservation, Remedies, Waste treatment, Sewage treatment, Water pollution sources, Project planning, Water resources, Water supply, Public health.

This article analyzes the Vermont water pollution control statute and compares the statute with present and proposed Tennessee water pollution law. The Vermont statute is deemed to take essentially a preventive approach to water pollution and conservation, while prescribing harsh penalties for violators. The statute seeks to classify the various waters of the state according to uses to which those waters can be put, consistent with the promotion of the general public welfare and interest in the areas of recreation, potable water supply, wildlife conservation, power, navigation, and industry. The law is obtained toward improvement of the water quality rather than to the mere maintenance of the existing quality levels. Effluent standards are incorporated into the system of permits required for all discharges whether polluting or not. The article analyzes the statute in the following areas: (1) organization of the water control agency, (2) jurisdiction of the agency, (3) procedures of the agency, (4) administrative procedure in enforcing standards, (5) powers and duties of the administrative agent, (6) remedies and penalties, (7) judicial review, (8) special interests protected or exempted, and (9) evaluation and comment on the Vermont statute. (See also W72-00475) (Horwitz-Florida)
W72-00512

VIRGINIA (ANALYSIS OF STATE WATER POLLUTION LAW AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE LAW),
Frank E. Maloney, and Thomas Buckner.
In: The 1971 Water Pollution Study for the State of Tennessee, Append 47, 1971. 16 p, 2 tab.

Descriptors: *Virginia, *Water pollution control, *Administrative agencies, *Legislation, State governments, Administrative decisions, Regulation, Water pollution, Water pollution sources, Cities, Permits, Legal aspects, Pollutants, Pollution abatement, Water quality, Water quality control, Local governments, Tennessee, Standards, Remedies, Administration.

The Virginia water pollution control act is considered adequate by this evaluation and comparison of that act with Tennessee law. The policy of Virginia's Act is to protect existing clean waters of the state and reduce existing pollution. The water control agency is the seven-member State Water Control Board. It has jurisdiction over all state waters. All sewage systems and treatment works are jointly controlled by the Board and the Department of Health. The Board advises the Department on an ad hoc basis as to treatment requirements for maintenance of applicable water standards. The Board may establish water quality standards consistent with the general policy of the Act. A certificate from the Board is required to discharge wastes; certificate holders must comply with changed standards in a reasonable time. Special cease orders may be issued to non-complying persons. Hearings may be demanded by aggrieved owners. The Act imposes no criminal penalties, but other statutes provide criminal sanctions for waste discharges. The Board may seek damages or injunctions for violations of the Act. Exhaustion of administrative remedies is not required by the Act; the filing of appeals does not stay an enforcement order. The Act provides for no specific exemptions from its provisions. (See also W72-00475) (Hart-Florida)
W72-00513

WASHINGTON (ANALYSIS OF STATE WATER POLLUTION LAW AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE LAW),
Frank E. Maloney, and Lewis Laska.
In: The 1971 Water Pollution Study for the State of Tennessee, Append 48, 1971. 20 p, 2 tab.

Descriptors: *Washington, *Water pollution control, *Legislation, *Administrative agencies, State governments, Administrative decisions, Regulation, Water pollution, Water pollution sources, Cities, Permits, Legal aspects, Pollutants, Pollution abatement, Water quality, Water quality control, Local governments, Tennessee, Remedies, Administration, Standards.

Washington's water pollution control law is considered very effective in this evaluation and comparison of that law with the Tennessee law. The time required for enforcement has been reduced. An executive branch agency enforces the law, while citizen participation is achieved through an advisory commission. A separate board conducts appeals. The legislature has restricted the Department's activity by requiring legislative approval for certain problems. The law is fragmented into different code sections; thus a complete understanding of the law is difficult. Except that municipalities are exempted from permit requirements, the permit provisions are very effective. The independent hearing board: (1) must render written decisions and consists of members who may not be politically involved and may not appear before the board within one year of membership. Hearings are public, but may be formal or informal. The penalty section renders only willful violations illegal and should be changed. Legal proceedings may be instituted only through the attorney general. An excellent tax credit plan for pollution control facilities is offered by the law. The act fails to state that a violation of an order or permit violates the act; this deficiency should be corrected. (See also W72-00475) (Hart-Florida)
W72-00514

WEST VIRGINIA (ANALYSIS OF STATE WATER POLLUTION LAW AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE LAW),
Frank E. Maloney, and David Dawson.
In: The 1971 Water Pollution Study for the State of Tennessee, Append 49, 1971. 19 p, 2 tab.

Descriptors: *West Virginia, *Water pollution control, *Administrative agencies, *State governments, Water pollution, Water pollution treatment, Financing, Permits, Regulation, Administration, Administrative decisions, Treatment facilities, Pollution abatement, Water quality, Water quality control, Standards, Remedies, Tennessee, Water law, Legislation, Legal aspects.

The West Virginia Water Pollution Control Act is considered effective to prevent, control, and abate water pollution. Adequate administrative and enforcement provisions exist, and the Water Resources Board is properly located in the governmental structure. The Board has quasi-legislative and judicial functions, while a sub-agency is responsible for enforcement. The major weakness of the Act is the dual jurisdiction over municipal and industrial waste treatment works. Both the Division of Sanitary Engineering and the Water Resources Division consider permits for these treatment works. The jurisdictional definitions in the Act are comprehensive; 'pollution' includes contamination and alteration as well as reduction of water quality. Sewer systems, treatment works, disposal systems, and wells are included. A comprehensive permit system is used to regulate potential pollution activities. Surveillance of permit activities, however, is limited by insufficient funds. Administrative enforcement orders may be issued without hearing, and emergency orders and injunctions are also available. Administrative and judicial review of orders are adequate and expeditious. It is recommended that the West Virginia water pollution control scheme be reorganized and consolidated to alleviate the dual-jurisdiction problems. (See also W72-00475) (Hart-Florida)
W72-00515

WISCONSIN (ANALYSIS OF STATE WATER POLLUTION LAW AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE LAW),
Frank E. Maloney, and Thomas Spieczny.
In: The 1971 Water Pollution Study for the State of Tennessee, Append 50, 1971. 16 p, 2 tab.

Descriptors: *Wisconsin, *Water resources development, *Administrative agencies, *Water pollution control, Water pollution, Water resources, State governments, Administrative decisions, Regulation, Permits, Pollutants, Pollution abatement, Treatment facilities, Cities, Financing, Government finance, Water quality, Water quality control, Standards, Local governments, Remedies, Tennessee, Water law, Legislation, Legal aspects.

Wisconsin's approach to water pollution and water resources development is considered modern and comprehensive by the author of this evaluation and comparison with Tennessee water laws. Within the Department of Natural Resources, an independent state agency, are planning, recreation, and water resources divisions. The Department has jurisdiction over all waters of the state, and is required to formulate, review, and execute a long-range water resources program. Plans are also formulated for water pollution control. The Department establishes water quality standards and regulates treatment and sewerage facilities and the consumptive use of water. Water quality standards vary with water usage. A financial assistance program exists for municipal pollution control facilities. Permits are required for operation of all treatment systems and septic tanks. Violation of the water pollution law is punishable by fine, although not specifically criminal. Complaints against pollution may be filed with the Department. Action is taken on the complaint by the Department after hearings and findings. Decisions of the Department may be judicially reviewed. (See also W72-00475) (Hart-Florida)
W72-00516

WYOMING (ANALYSIS OF STATE WATER POLLUTION LAW AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE LAW),
Frank E. Maloney, and James McDaniel.
In: The 1971 Water Pollution Study for the State of Tennessee, Append 51, 1971. 12 p, 2 tab.

Descriptors: *Wyoming, *Water pollution control, *Legal aspects, *Administrative agencies, Water pollution, Water pollution sources, Water resources, Water resources development, Regulation, Permits, Pollution abatement, Cities, Water quality, Water quality control, Remedies, Tennessee, Water law, Legislation.

Wyoming's water pollution control law is considered completely inadequate by the author of this evaluation and comparison of that law with the water pollution control law of Tennessee. The Wyoming law deals mainly with supply for domestic use. The Department of Health and Social Services administers the law. A ten-member council advises the Department of Health. Although jurisdiction over persons is doubtful, industrial, municipal, and railroad operations are within the Agency's jurisdiction. No specific provisions exist for prevention, control, or abatement of pollution, although the Act requires that a comprehensive program be developed. Plans and specifications for all new industrial plants, roads, and electrical plants must be submitted and approved. No administrative hearing is provided for in the Act; injunctive enforcement, however, may be achieved through district courts. Violations of the Act are punishable by fine and imprisonment. An order of the Board may also be appealed in the district court. The Act makes no provision for special interests. The evaluation states that the Wyoming law has negligible value and should be replaced by a comprehensive plan for government control and protection of waters. (See also W72-00475) (Hart-Florida)
W72-00517

FEDERAL WATER POLLUTION CONTROL ACT,
Frank E. Maloney, William Blanchard, and Richard Jarashow.
In: The 1971 Water Pollution Study for the State of Tennessee, Append 52A1, 1971. 19 p, 2 tab.

Descriptors: *Federal government, *Regulation, *Water pollution control, *Navigable rivers, Pollution abatement, State governments, Jurisdiction, Legal aspects, Standards, Permits, Inspection, Legislation, Administrative agencies, Water pollution, Financing, Project planning, Treatment facilities, Water quality control, Water pollution sources, Waste disposal, Tennessee, Administration, Supervisory control (Power).

The Federal Water Pollution Control Act is analyzed and compared to present and proposed Tennessee pollution law. The Environmental Policy Act of 1969 transferred the functions of the Federal Water Quality Administration from the Department of the interior to the newly established Environmental Protection Agency. This did not radically alter the implementation of water pollution control measures, but did recognize the fundamental benefit water pollution control can have on the general condition of the environment. The Environmental Protection Agency must establish a national policy for the prevention, control, and abatement of water pollution, while recognizing the primary right and authority of the states. The primary function of the agency is to approve state standards and classifications and to disburse funds for projects, facilities, and studies. The federal law is analyzed by considering the following areas: (1) organization of the water control agency, (2) jurisdiction of the agency, (3) procedures of the agency, (4) administrative procedures in enforcing standards, (5) powers and duties of the administrative agent, (6) remedies and penalties, (7) judicial review of administrative determinations, (8) special interests protected or exempted, and (9) a concise evaluation of the federal law. (See also W72-00475) (Horwitz-Florida)
W72-00518

SUPPLEMENT TO FEDERAL PROGRAM SECTIONS,
Frank E. Maloney.
In: The 1971 Water Pollution Study for the State of Tennessee, Append 52A2, 1971. 13 p, 2 tab.

Descriptors: *Federal government, *Legislation, *Water pollution control, *Administration, Pollution abatement, State governments, Effluents, Standards, Permits, Inspection, Political aspects, Legal aspects, Public health, Regulation, Water pollution, Air pollution, Water quality control, Administrative agencies, Project planning, Supervisory control (Power), Jurisdiction, Tennessee.

A proposed amendment to the Federal Water Pollution Control Act submitted by the Environmental Protection Agency is analyzed and compared to present and proposed Tennessee pollution law. The new proposal is designed to strengthen and clarify the authority of the Environmental Protection Agency in the establishment and enforcement of water quality standards. The changes give more power to the Agency Administrator by providing him with the authority to take emergency action. The Administrator is also empowered to assess large civil fines in addition to appropriate injunctive relief. The watch-dog provisions are strengthened by providing broader discovery mechanisms. Another significant provision is the authorization of suits by private citizens to compel the Administrator to carry out his non-discretionary tasks and to enforce the Act against polluters without waiting for official government actions. Time delays would be alleviated by the revised

hearing procedure, which eliminates the conference and 180-day notice requirements. Recommendations would be replaced by final orders of the Administrator after the public hearing. Also, the state governors would be authorized to request that federal action be commenced. (See also W72-00475) (Horwitz-Florida)
W72-00519

ANNUAL USER SURVEILLANCE FEE,
Frank E. Maloney.
In: The 1971 Water Pollution Study for the State of Tennessee, Append 54, 1971. 4 p.

Descriptors: *Tennessee, *Assessments, *Cost transfer, *Monitoring, Legislation, Legal aspects, Water law, Regulation, Non-structural alternatives, Water pollution control, Permits, State governments, Costs, Government finance, Income, Discharge measurement, Financing.

As originally proposed, water pollution control legislation for Tennessee called for the imposition of a user-surveillance fee to help defray the cost of monitoring an expanded water pollution control program; however, the section of the bill imposing the fee was deleted by the Legislature. The fee was to be imposed on all permittees under the Act and would have been an annual fee based on the volume of discharges into the waters. The schedule of fees was to be established by the Water Quality Control Board, but would have required approval by the Legislature. All fees received, less a maximum of 10% for collection expenses, would be allocated for the use of the Division. Commentary on the proposed section explains the purpose of and the reasoning behind the section. The general purpose was to generate funds for use in water pollution control programs. The commentary also briefly describes the applicable fee systems which exist in eight other states. Only one of these states, Illinois, allows the pollution control agency to set the fee schedule. (See also W72-00475) (Johnson-Florida)
W72-00520

MAGNOLIA PETROLEUM CO. V. MCGEELEY (PAYMENT FOR VOID EASEMENTS AS OFFSET TO RECOVERY FOR POLLUTION DAMAGES).
223 p .2d 131-136 (Okla. 1950).

Descriptors: *Oklahoma, *Waste water (Pollution), *Saline water, *Easements, Water law, Judicial decisions, Legal aspects, Water pollution, Water pollution sources, Water pollution effects, Oil wastes, Oil wells, Damages, Waste disposal, Pollution abatement, Soil contamination effects, Soil contamination, Pollutant identification.

Plaintiff landowner sought to recover for permanent injuries to his land caused by defendant oil companies, which were alleged to have allowed salt water and other deleterious substances to escape from their oil wells. Defendants contended that the pollution caused by their wastes was not severe enough to have caused the harm complained of and that they had purchased an easement from plaintiff which turned out to be void. The Supreme Court of Oklahoma found that the evidence of decrease in the value of the property and the admission of pollution by defendant sustained the verdict for plaintiff. The court also ruled that consideration paid in good faith for a void easement may be considered by a court of equitable powers as an offset against any judgment given plaintiff for damages arising from the same or similar causes as those for which defendant undertook to satisfy plaintiff by purchasing the easement. It was therefore held that the judgment should be reduced. (Johnson-Florida)
W72-00543

KINNISCHTZKE V. CITY OF GLEN ULLIN (LIABILITY OF MUNICIPALITY DISCHARGING INADEQUATELY TREATED SEWAGE).
57 N.W.2d 588-600 (N.D. 1953).

Descriptors: *North Dakota, *Water pollution sources, *Damages, *Sewage disposal, *Municipal wastes, Water pollution, Water pollution control, Water pollution effects, Water quality, Water quality control, Cities, Judicial decisions, Legal aspects, Water law, Remedies, Sewage, Sewage treatment, Water resources, Streams, Local governments, Relative rights.

Plaintiff landowner sued defendant city for damages based on negligent injury to his personalty and realty. The city discharged inadequately treated sewage into a creek flowing through plaintiff's premises. Plaintiff alleged that this reduced the value of his land and cattle. Defendant maintained that: (1) it was acting in its governmental capacity and was therefore not liable, (2) the sewage was properly treated, and (3) plaintiff was estopped because he bought the land with knowledge of the discharge. Defendant also requested an instruction that plaintiff was not entitled to any damages for harm to his cattle because no evidence had been introduced. This request was denied. The Supreme Court of North Dakota reversed a judgment for plaintiff and remanded for a new trial. The court held that where injury to both cattle and land are alleged to result from the improper discharge of sewage, it is reversible error for a trial court to refuse instructions that plaintiff is not entitled to damages for injury to cattle if the evidence fails to show such injury. The court ruled that when municipality purposely or negligently operates a sewage plant so that it becomes a nuisance, it is liable for resulting damage to property. (Robinson-Florida)
W72-00544

6F. Nonstructural Alternatives

FOOD PLAIN INFORMATION, BAD RIVER AT FORT PIERRE, SOUTH DAKOTA.
Corps of Engineers, Omaha, Nebr.
For primary bibliographic entry see Field 04A.
W72-00055

FLOOD-PLAIN MANAGEMENT MUST BE ECOLOGICALLY AND ECONOMICALLY SOUND,
For primary bibliographic entry see Field 02E.
W72-00117

WYOMING (ANALYSIS OF STATE WATER POLLUTION LAW AND COMPARISON WITH PRESENT AND PROPOSED TENNESSEE LAW),
For primary bibliographic entry see Field 06E.
W72-00517

6G. Ecologic Impact of Water Development

THE FOREST ENVIRONMENT--PROBLEMS AND PROMISES,
Oregon State Univ., Corvallis. Dept. of Forest Engineering.
For primary bibliographic entry see Field 06D.
W72-00010

MOVEMENT-BEHAVIOR IN THREE SPECIES OF COLONIAL-NESTING WADING BIRDS: A RADIO-TELEMETRIC STUDY,
Auburn Univ., Ala.
For primary bibliographic entry see Field 07B.
W72-00051

MANAGEMENT MODEL FOR TERRESTRIAL WILDLIFE BASED ON ENERGY RELATIONSHIPS,
Massachusetts Univ., Amherst.
J. R. Wilkitis.
Massachusetts University Water Resources Research Center Report, August 1970. 66 p, 6 fig, 20 tab, 33 ref, 2 append. OWRR B-004-MASS (3).

Descriptors: *Wildlife habitats, *Deer, *Massachusetts, *Mathematical models, Birds, Wildlife management, Forests, Habitats, Regression analysis, Statistical models, Statistical methods, Carrying capacity, Food abundance, Productivity.
Identifiers: Wildlife management models.

A management planning model was derived for two coinhabitating population of terrestrial wildlife, the white-tailed deer and ruffed grouse, based on the energetics of their winter food and shelter. Five forest classes, representing the majority of forest types in the Millers River Watershed in Massachusetts were sampled to determine food and shelter conditions in winter. Hemlock stands were significantly warmer during sampling nights, than young white pine, northern hardwoods, mature white pine, or open field. The softwood-hardwood forest class with 51 to 80% crown closure had the highest browse production per acre, followed by hardwoods with 81 to 100% crown closure, hardwoods with 51 to 80% crown closure, softwood-hardwoods with 81 to 100% crown closure, and softwoods with 81 to 100% crown closure. A parametric linear dynamic program produced tables and maps of animal population structure for different changes of independent variables. A management model for white-tailed deer and ruffed grouse based on the energetics of their winter food and shelter in any size watershed is feasible and practical and it can provide realistic guidelines for management decisions. (See also W72-00053) (Knapp-USGS)
W72-00052

UTILIZATION OF INTERSTATE HIGHWAY CONSTRUCTION TO CREATE PRODUCTIVE WETLANDS FOR WILDLIFE,
Massachusetts Univ., Amherst, Dept. of Forestry and Wildlife.
For primary bibliographic entry see Field 04C.
W72-00053

DAMS AND ECOLOGY--CAN THEY BE MADE COMPATIBLE,
Civil Engineering Magazine, New York.
For primary bibliographic entry see Field 08A.
W72-00116

THE FISHERY POTENTIAL OF FOUR AQUATIC ENVIRONMENTS CREATED BY INTERSTATE ROUTE 91 CONSTRUCTION IN MASSACHUSETTS,
Massachusetts Univ., Amherst.
For primary bibliographic entry see Field 04C.
W72-00135

OKLAHOMA COPAN LAKE, LITTLE CANEY RIVER, FLOOD CONTROL, WATER QAULITY, WATER SUPPLY, FISH AND WILDLIFE AND RECREATION LAKE LOCATED IN WASHINGTON, COUNTY.
Army Engineer District, Tulsa, Okla.

Available from National Technical Information Serive as PB-200 337, $3.00 in paper copy, $0.95 in microfiche. Draft environmental statement, 21 June 71. 33 p.

Descriptors: *Environmental effects, *Flood control, *Water quality control, *Water supply, *Recreation, Reservoirs, Oil wells.
Identifiers: *Environmetnal surveys, Wildlife, Recreational buildings, Commercial buildings, Highways, Railroads, Relocation, *Environmental impact statements, *Copan Lake, *Washington County (Oklahoma).

The proposed Copan Lake will be located approximately 2 miles southwest of Copan on the Little Caney River at river mile 7.4 in Washington County, Oklahoma. The project is comprised of a flood control, water quality control, water supply, fish and wildlife, and recreation lake. The project will reduce annual flood damages in the Caney and Little Caney River basins downstream from the dam.

Down-stream water releases will provide improved water quality. The greater prairie chicken considered rare and endangered nationally, is present in the project area. The overall status of the prairie chicken is expected to be unaffected by the project. The maintenance of the conservation pool will inundate 4,850 acres. In addition to its primary uses, this land also provides food and cover for wildlife. The lake will cover 14 miles of natural stream. Some marginal oil production will also be terminated. Several buildings, highways, country roads, railroads, utilities, and two cemeteries will be affected by the project.
W72-00348

TECHNOLOGY AND MANAGEMENT OF THE ENVIRONMENT.
For primary bibliographic entry see Field 05G.
W72-00426

SUBTLE ASPECTS OF ECOSYSTEM MANAGEMENT,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
David A. Bella.
Oregon State University, Water Resources Research Institute, Seminar WR 014.71, July 1971, p 57-64. 1 fig, 9 ref.

Descriptors: *Environmental gradient, *Balance of nature.
Identifiers: *Ecosystems, *Dispersed systems, *Chain systems, Organized simplicity, Disorganized complexity, Sub-systems, Components, Interrelationships, Environmental control.

An analysis of both man-made systems and natural systems, such as society or the environment, was conducted. The analysis revealed that most man-made systems are relatively simple, being built from isolated parts which have little, if any, interaction on parts other than the next direct part in the sequence. Elimination or replacement of such a part would not produce far reaching consequences, largely because of the small effect of each individual part. In an ecosystem, however, each individual component is involved in complex interactions with countless numbers of other components. Based on these conclusions, it was determined that when man changes some component of the ecosystem, the consequences may be far reaching. The ability of man to make systems, therefore, will exceed by an ever increasing amount man's ability to evaluate the consequences of his changes. (See also W72-00426) (Lowry-Texas)
W72-00430

CASES AND MATERIALS ON ENVIRONMENTAL LAW,
For primary bibliographic entry see Field 06E.
W72-00456

07. RESOURCES DATA

7A. Network Design

ANALOG ANALYSIS OF WATER DISTRIBUTION NETWORKS,
Kentucky Univ., Lexington.
D. J. Wood.
Proc Amer Soc Civ Eng, Transp Eng J, Vol 97, No TE2, p 281-290, May.
Identifiers: Friction head, Hardy Cross Method.

A technique for solving hydraulic network flow distribution problems using a standard analog computer can be applied to networks which include various hydraulic components such as valves and pumps. The proposed indirect analog simulation has the advantage that only a standard analog is needed and not specially constructed direct analog devices. Once the basic flow network is simulated, such parameters as pipe diameters, pipe lengths, and pump characteristics can be changed by resetting a potentiometer. The network can be rebalanced in seconds and new flow distribution and pressures determined. In a relatively short time, a large number of parametric studies can be accomplished and use to search for a low cost design for the network. Examples illustrate the technique used for solving flow distribution problems, and are used to compare analog solutions to those obtained by a conventional Hardy-Cross analysis; results are nearly identical. (USBR)
W72-00071

THE USE OF RADIOACTIVE CARBON METHOD IN STUDIES OF TROPHIC RELATIONSHIPS OF PLANKTON (PRIMENENIE RADIOUGLERODNOGO METODA DLYA ISUCHENIYA TROFICHESKIKH VZAIMOOTNOSHENII V PLANKTONE),
Akademiya Nauk SSSR, Leningrad. Zoologicheskii Institut.
For primary bibliographic entry see Field 05C.
W72-00161

GLOBAL ENVIRONMENTAL MONITORING,
Center for the Environment and Man Inc., Hartford, Conn.
For primary bibliographic entry see Field 05C.
W72-00162

7B. Data Acquisition

MOVEMENT-BEHAVIOR IN THREE SPECIES OF COLONIAL-NESTING WADING BIRDS: A RADIO-TELEMETRIC STUDY,
Auburn Univ., Ala.
D. L. Bateman.
Ph D Thesis, Auburn University, December 9, 1970. 233 p, 111 fig, 18 ref, append.

Descriptors: *Birds, *Animal behavior, *Alabama, *Florida, *Wildlife habitats, Wildlife, Tracking techniques, Telemetry, Food habits, Diurnal, Diel migration, Environment, Nesting, Nests, Wildlife management, Food and cover crops, Environmental effects.
Identifiers: *Cattle egrets, *White Ibis, *Little Blue Herons.

The daily movements and behavior of Cattle Egrets, White Ibises, and Little Blue Herons were investigated in southeast Alabama and northwest Florida. Usually, a bird used two different feeding areas daily, often many miles apart. Average and maximum distances (in miles) traveled daily while gathering food were: Cattle Egret, 32 and 45; and White Ibis 23 and 65. One Little Blue Heron traveled 18 miles each day he was tracked. Daily movement patterns were found to vary with breeding status and stage of nesting. Non-breeding birds spent their entire day feeding at one location, did not make regular midday return trips to the colony, and were sometimes only loosely attached to the colony. While nestlings were less than two weeks old parents alternated in attendance at the nest. After the nestlings had reached 2-3 weeks of age, adults were in attendance at the nest very little. In addition to the daily patterns, two major long-range movement patterns were: (1) the repeated use of established feeding sites according to a definite pattern, suggesting rich habitats where the birds could capture adequate amounts of food, and (2) the changing of feeding areas, probably after encountering difficulty in obtaining food there. The colony radius of influence was estimated to be about 20 miles. (Knapp-USGS).
W72-00051

SOME SIMPLE DEVICES FOR THE STUDY OF WAVE INDUCED SURGES,
University of Southern California, Los Angeles. Dept. of Gelogical Sciences.
For primary bibliographic entry see Field 02E.
W72-00056

THE BRISTOL FALL COLUMN FOR COARSE SEDIMENT GRADING,
Bristol Univ. (England). Dept. of Geology.
For primary bibliographic entry see Field 02J.
W72-00057

DESIGN AND OPERATION OF A TRIAXIAL, HIGH-TEMPERATURE, HIGH-PRESSURE COMPACTION APPARATUS,
University of SOUTHERN California, Los Angeles. Dept. of Petroleum Engineering.
For primary bibliographic entry see Field 02J.
W72-00058

PRECISE SEDIMENT DENSITY DETERMINATION BY GAMMA-RAY ATTENUATION ALONE,
National Inst. of Oceanography, Wormely (England).
For primary bibliographic entry see Field 02J.
W72-00059

TENTATIVE APPLICATION OF A TELETHERMOMETER FOR MEASUREMENT OF WATER-SURFACE TEMPERATURE (OPYT PRIMENENIYA DISTANTSIONNOY USTANOVKI DLYA IZMERENIYA TEMPERATURY POVERKHNOSTI VODY),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02H.
W72-00070

IMPROVED DISCRETE DEPTH SAMPLER,
Naval Underwater Systems Center, Newport, R.I. Ocean Science Dept.
D. F. Giuliano, and G. F. Battista.
Available from NTIS, Springfield, Va 22151 as AD-725 113-$3.00 paper copy; $0.95 microfiche. Naval Underwater Systems Center, Report No. 4083, March 20, 1971. 6 p, 3 fig, 5 ref. NUSC No A-400-03-00.

Descriptors: *Instrumentation, *Sounding, *Sampling, *Electronic equipment, Remote sensing, Temperature, Marine animals, Monitoring, Gages, Research equipment.
Identifiers: *Marine biology (Sampling), Ocean Acre.

Improvements in the electronics system controlling the four-chambered discrete depth sampler (DDS) on an Isaacs-Kidd Midwater Trawl are described. A resonant reed relay and voltage transfer relays are utilized to control the solenoids that close the doors of the DDS. To obtain depth and water temperature data from Ocean Acre 10, a resistive depth gage and resistive temperature probe were incorporated into the system. These operate on a timer so that depth and temperature can be read alternately for 3 minutes each. The improved system is more reliable and allows greater flexibility than the original system. (Lang-usgs0
W72-00093

AN AUTOMATIC RUNOFF SAMPLER,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
O. E. Cross.
Available from the National Technical Information Service as PB-203 682, $3.00 in paper copy, $0.95 in microfiche. Paper No 71-520, presented at 1971 Annual Meeting of the American Society of Agricultural Engineers, Washington, State University, Pullman, June 27-30, 1971. 4 fig. OWRR B-003-NEB (2).

Descriptors: *Surface runoff, *Sampling, *Automatic control, *Instrumentation, *Electronic equipment, Electric relays, Electric switches, Irrigation, Overland flow, Data collections, Rainfall, Time of concentration, Mechanical control.
Identifiers: *Automatic sampler (Overland flow).

A runoff sampling device is described that will automatically start itself, collect samples, and cease operation after a predetermined time period. The sampler must be reset for the next runoff event. The sampler may also be utilized to collect samples resulting from irrigation runoff. The major design parameters imposed upon this device were: (1) Activation whenever runoff occurred; (2) Samples taken at preselected time intervals; (3) Continuously record quantity of runoff; (4) Prevent intermixing of successive samples; and (5) Deactivate all circuitry after completion of sampling cycle. Illustrations show the unit with sample containers mounted on a turntable and the schematic wiring diagram for the sampler. A small capacity pump and flexible tubing delivers water to the sampler containers. The unit may be designed to operate on alternating or direct current. (Woodard-USGS)
W72-00118

A PROCEDURE FOR TRACING OF KRAFT MILL EFFLUENT FROM AN OCEAN OUTFALL BY CONSTITUENT FLUORESCENCE,
Pacific Northwest Water Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 05B.
W72-00123

WATER RESOURCE POLLUTANT IDENTIFICATION BY DIGITAL COMPUTER ANALYSIS OF REMOTE INFRARED SENSOR SPECTRAL INTENSITIES,
Clemson Univ., S.C. Dept. of Electrical Engineering.
For primary bibliographic entry see Field 05A.
W72-00305

A METHOD OF TRACING SEDIMENT MOVEMENT ON THE TEXAS GULF COAST,
Texas A and M Univ., College Station. Coastal and Ocean Engineering Div.
For primary bibliographic entry see Field 02J.
W72-00314

ACCURACY OF FIELD HYDROMETRIC WORK IN STUDYING SUBSURFACE FLOW (TOCHNOST' EKSPEDITSIONNYKH GIDROMETRICHESKIKH RABOT PRI IZUCHENII PODZEMNOGO STOKA),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02F.
W72-00322

ANALYSIS OF WAVE RECORDS,
Army Coastal Engineering Research Center, Washington, D.C.
D. Lee Harris.
Proceedings, 12th Coastal Engineering Conference, Wash. DC, Sep, 1970, p 85-100 2d Report R1-71.

Descriptors: *Gages, *Waves (Water), Design date.
Identifiers: *Wave gages, Wave heights.

Data obtained from two surface profile wave gages and two pressure wave gages at the Steel Pier in Atlantic City, New Jersey, are used to check the consistency of the analysis variables obtained from a given set of records by several commonly used analysis procedures. All estimates of the characteristic height tested are found to be correlated better than .86. The estimates of characteristic period are not so satisfactory and in some cases are below .25. Consideration of several proposed definitions of the characteristic period indicates that they are based more on convenience in data processing than on application of the derived data. Consideration of the use of wave data in engineering design shows that no one definition of the period can be satisfactory for all applications. The best definition of the characteristic wave period for a given engineering problem can be specified only when the dynamic aspects of the problem have been identified.
W72-00350

COMPARISON OF PRESSURE AND STAFF WAVE GAGE RECORDS,
Army Coastal Engineering Research Center.
D. Esteva, and D. Lee Harris.
Proceedings, 12th Coastal Engineering Conference, Wash. DC, Sep, 1970, p 101-116, and Report R 2-71.

Descriptors: *Gages, *Waves (Water).
Identifiers: *Wave gages.

Simultaneous records from two pressure gages located at different depths, a step-resistance relay gage, and a continuous-wire staff gage have been collected at Atlantic City, N.J. Spectra and cross-spectra are computed using the Fast Fourier Transform Algorithm (FFT) method proposed by Cooley and Tukey. Individual harmonics of the pressure energy spectra are compensated for pressure attenuation according to classical theory. Results indicate better agreement is obtained between the wave height and the spectra computed from the compensated pressure gages and those computed from the continuous-wire staff gage than between the two surface gages. Values of coherences are near .98 in the energy-containing part of the spectrum, and are always larger for the pressure-continuous wire staff cases than for the two surface gages which are displaced from each other only 12 feet in the horizontal.
W72-00352

EVALUATION OF NATURAL RIVER ENVIRONMENTS: PHASE II,
State Univ. of New York, Binghamton. Research Foundation.
For primary bibliographic entry see Field 06B.
W72-00357

APPARATUS FOR CONTROLLING AMBIENT LIGHT CYCLES IN EXPERIMENTAL ENVIRONMENTS,
D. A. Wickham, J. B. Cagle, and F. Hightower, Jr.
Trans Amer Fish Soc. 100 (1): 1971. 128-131.
Copyright 1971, Biological Abstracts, Inc.
Identifiers: Ambient, Apparatus, Controlling, Cycles, Environments, Light.
W72-00525

7C. Evaluation, Processing and Publication

INVENTORY OF GLACIERS IN THE NORTH CASCADES, WASHINGTON,
Geological Survey, Washington, D. C.
A. Post, D. Richardson, W. V. Tangborn, and F. L. Rooselot.
Available from gpo, wash., DC 20402-$2.00 (paper cover). Geological Survey Professional Paper 705-A, 1971. 26 p, 4 fig, 3 plate, 3 tab, 15 ref.

Descriptors: *Glaciers, *Washington, *Hydrolic data, Data collections, Surveys, Glaciation, International Hydrological Decade, Topography, Water balance, Movement, Regimen, Water sources, Water yield.
Identifiers: North Cascade Mountains (Wash).

Perennial bodies of ice in the North Cascades, Washington, having areas of at least 0.1 square kilometer are tabulated and classified. The inventory, a contribution to the International Hydrological Decade, includes 756 glaciers, covering 267 square kilometer, about half of the glacier area in the United States south of Alaska. Listings include glacier's location, drainage basin, area, length, orientation, altitude, and classification as to form, source, surface, nature of terminus, and activity. These glaciers contribute annually about 800 million cubic meters of water to stream flow in the State of Washington. (Knapp-USGS)
W72-00060

MONTE CARLO STUDY OF SEISMIC STRUCTURAL SAFETY,
Arizona Univ., Tucson; and New Mexico Univ., Albuquerque.
P. H. Wirsching, and J. T. P. Yao.
Proc Amer Soc Civ Eng, J Struct Div, Vol 97, No ST5, p 1497-1519, May, 1971. 23 p, 16 fig, 2 tab, 35 ref, 2 append.

Descriptors: Analog computers, Dynamics, *Earthquakes, Analog models, Safety, Simulation, Statistical analysis, *Monte Carlo method, *Computer applications, Computer models, Seismic studies, Computer programs, Earth movements, *Structural behavior, Seismology, Bibliographies, Earthquake engineering, Seismic investigations, Gaussian distribution.

A simulation of the lateral ground motion of strong earthquakes is performed using a random function generator and an analog computer. The statistical properties of the simulated earthquake are similar to those of actual earthquakes. The simulation is then used as the excitation applied to a structural system, which is also modeled on the analog computer. The statistical behavior of the magnitude of the peak response of the structure is established using a basic Monte Carlo technique with several simulations of the earthquake and associated structural responses. The analog computer is more advantageous than the digital computer because several simulations can be performed in a relatively short time. The Gumbel Type I distribution of maxima is used to describe the distribution of responses. The experimentally determined statistical parameters relate directly to the seismic safety of a structure. A study of the seismic reliability of the bilinear hardening system is given. (USBR)
W72-00072

COMPUTER SIMULATION OF THE HYDROLOGIC-SALINITY FLOW SYSTEM WITHIN THE UPPER COLORADO RIVER BASIN,
Utah State Univ., Logan. Utah Water Research Lab.
M. Leon Hyatt, J. Paul Riley, M. Lynn McKee, and Eugene K. Israelson.
Available from the National Technical Information Service as PB-203 674, $3.00 in paper copy, $0.95 in microfiche. Report PRWG 54-1, July, 1970, 255 p, 109 fig, 31 tab, 85 ref, 9 append. EPA Program 16090 DV21 07/70.

Descriptors: Water quality, *Colorado River basin, *Salinity, *Model studies, *Computer models, *Irrigation efficiency, *River basins, Water demands, Water utilization, *Forecasting, Flow, Utah.
Identifiers: San Juan River basin.

Changes in the hydrologic equilibrium of a river basin resulting from resource development also produce changes in the quality pattern. Since the burden of quality maintenance must be shared by users (just as are quantities) predictions are needed for quality changes which might result from contemplated development at any specified location within the river system. This study reports the development of a computer simulation model of the water and salt flow systems within the Upper Colorado River basin. Because of the close relationship between the hydrologic and salinity flow systems, an understanding of the hydrologic system is essential to successful management of the salinity system. In this study development of a hydrologic model is based on water budgeting or accounting procedures, in which available data on historical water flows, municipal and industrial uses, and the demands of agriculture are used. The salinity dimension is then added, and the joint hydro-salinity model is verified (calibrated and tested) by comparing computed and observed output values. The utility of the model is demonstrated by applying it to a particular subbasin of the San Juan River and predicting the effects on downstream water quantity and quality of developing a large irrigation project within the area.
W72-00084

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR ELM FORK TRINITY RIVER, TRINITY RIVER BASIN, TEXAS, 1969,
Geological Survey, Austin, Tex. Water Resources Div.
J. N. Sanson.
Geological Survey Data Report, July 1971. 47 p, 2 fig, 3 tab.

Descriptors: *Hydrologic data, *Data collections, *Small watersheds, *Texas, *Rainfall-runoff relationships, Water storage, Stream gages, Rain gages, Water yield, Reservoirs, Surface waters, Watershed management, Flood control.
Identifiers: *Trinity River Basin (Tex).

This report, which is the tenth in a series of basic-data reports published annually for the Elm Fork Trinity River study area, contains the rainfall, runoff, and storage data collected during the 1969 water year for the 46.0-square mile area above the stream-gaging station Elm Fork Trinity River near Muenster, Texas. The locations of floodwater-retarding structures and hydrologic instruments in the area are shown. These 14 structures provide capacity for flood-detention storage of 10,500 acre-feet of flood runoff from 33.5 square miles of the 46.0 square-mile drainage area. The average rainfall for the 1969 water year was 33.95 inches, or 99.5 percent of the 13-year (1957-69) average. The monthly rainfall totals ranged from a low of 1.15 inches in December to a high of 6.38 inches in May. The mean daily discharge was 29.9 cfs, as compared with the 13-year (1957-69) average of 20.0 cfs. Total runoff during the year at the stream-gaging station was 21,640 acre-feet, or 8.82 inches, which is 26 percent of the total rainfall. (Woodard-USGS)
W72-00097

INDEX OF SURFACE-WATER RECORDS TO SEPTEMBER 30, 1970--PART 10. THE GREAT BASIN.
Geological Survey, Washington, D.C.

Geological Survey Circular 660, 1971. 39 p, 1 fig, 1 tab.

Descriptors: *Gaging stations, *Streams, *Streamflow, *Great Basin, *Documentation, Hydrologic data, Data collections, Reservoirs, Lakes, Nevada, Idaho, Utah, California, Wyoming, Oregon, Surface waters, Publications.
Identifiers: *Index, *Surface-water records (Great Basin).

Streamflow and reservoir stations in The Great Basin (in Nevada and parts of adjoining states) for which records have been or are to be published in reports of the Geological Survey for periods through September 30, 1970 are listed. In addition to the continuous-record gaging stations, this index includes crest-stage and low-flow partial-record stations. A continuous-record station is a gaging station on a stream or reservoir for which the discharge, stage, or contents is published on a daily, weekly, or monthly basis for a continuous period of time. A crest-stage partial-record station is a streamflow station for which only the annual maximum discharge is published over a period of years for use in floodflow analyses. A low-flow partial-record station is a streamflow station for which only discharge measurements made at base flow, when streamflow is primarily from groundwater storage, are published; measurments are generally collected over a period of five years or more for use in low-flow analyses. (Woodard-USGS)
W72-00098

INDEX OF SURFACE-WATER RECORDS TO SEPTEMBER 30, 1970--PART 15. ALASKA.
Geological Survey, Washington, D.C.

Geological Survey Circular 665, 1971. 21 p, 1 fig, 1 tab.

Descriptors: *Gaging stations, *Streams, *Alaska, *Documentation, *Streamflow, Hydrologic data, Data collections, Publications, Surface waters, Lakes, Reservoirs.
Identifiers: *Index, *Surface-water records (Alaska).

The streamflow stations in Alaska (approximately 600) for which records have been or are to be published in reports of the Geological Survey for periods through September 30, 1970 are listed. In addition to the continuous-record gaging stations, this index includes crest-stage partial-record stations. A continuous-record station is a gaging station on a stream or reservoir for which the discharge, stage, or contents is published on a daily, weekly, or monthly basis for a continuous period of time. A crest-stage partial-record station is a streamflow station for which only the annual maximum discharge is published over a period of years for use in floodflow analyses. (Woodard-USGS)
W72-00099

STREAMFLOW ROUTING FOR WATER POLLUTION STUDIES,
Northeastern Univ., Boston, Mass.
For primary bibliographic entry see Field 05G.
W72-00124

WATER RESOURCE POLLUTANT IDENTIFICATION BY DIGITAL COMPUTER ANALYSIS OF REMOTE INFRARED SENSOR SPECTRAL INTENSITIES,
Clemson Univ., S.C. Dept. of Electrical Engineering.
For primary bibliographic entry see Field 05A.
W72-00305

STOCHASTIC DIFFERENCE EQUATION MODELLING OF HYDROLOGIC PROCESSES,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
For primary bibliographic entry see Field 02A.
W72-00306

CHARACTERISTICS AND FILTERING OF NOISE IN LINEAR HYDROLOGIC SYSTEMS,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
For primary bibliographic entry see Field 02A.
W72-00310

LINEAR SYSTEMS ANALYSIS IN HYDROLOGY--THE TRANSFORM APPROACH, THE KERNEL OSCILLATIONS AND THE EFFECT OF NOISE,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
For primary bibliographic entry see Field 02A.
W72-00317

FEASIBILITY OF COMPUTER CONTROL OF WASTEWATER TREATMENT.
American Public Works, Associated, Chicago, Ill.
For primary bibliographic entry see Field 05D.
W72-00408

08. ENGINEERING WORKS

8A. Structures

MONTE CARLO STUDY OF SEISMIC STRUCTURAL SAFETY,
Arizona Univ., Tucson; and New Mexico Univ., Albuquerque.
For primary bibliographic entry see Field 07C.
W72-00072

MODEL LAW TO IMPROVE DAM SAFETY,
USCOLD Committee on Model Legislation for State Safety of Dams, New York.
For primary bibliographic entry see Field 06E.
W72-00073

DAMS AND ECOLOGY--CAN THEY BE MADE COMPATIBLE,
Civil Engineering Magazine, New York.
D. J. Turner.
Civil Engineering, Vol 41, No 9, p 76-79, September 1971. 3 fig.

Descriptors: *Dams, *Ecology, *Environmental effects, *Reservoirs, *Ecosystems, Dam design, Damsites, Dam construction, Surveys, Planning, Wildlife conservation, Fish conservation, Diseases, Water quality control, Sedimentation, Watershed management, Water resources development.

A study of the Aswan High Dam and the proposed dams on Southeast Asia's Mekong River shows that more pre-investment study is now mandatory. Egypt's Aswan High Dam has produced 7 billion kwhr of electricity annually, has brought 900,000 acres of land under cultivation, and has increased the national income by more than $500 million each year. Egypt's Aswan High Dam has contributed to a 95 percent loss in the sardine catch in the eastern Mediterranean; has been a factor in the increase in the infection rate of bilharziasis from zero to 80 percent, and is trapping over 100 million tons of silt annually. Damming the Mekong River will produce enormous amounts of power for Southeast Asia. The Pa Mong Dam alone would impound 80 million acre-ft of water to produce 20 billion kwhr annually. In addition, the project could raise agricultural production, needed to feed the region's rapidly increasing population. In addition to the resettlement problem, stabilizing of the aquatic environment could lead to an increase in disease vectors. This has already happened in the Nile basin. Debilitating intestinal diseases such as schistosomiasis and bilharziasis have been transmitted from snail to fish to man there, and ecologists fear the same thing could happen if large dams were built along the Mekong. Such problems as destruction of fish and wildlife, increase or disease, and mass relocation of people can often be avoided by making careful pre-construction surveys. (Woodard-USGS)
W72-00116

8B. Hydraulics

ANALOG ANALYSIS OF WATER DISTRIBUTION NETWORKS,
Kentucky Univ., Lexington.
For primary bibliographic entry see Field 07A.
W72-00071

DESIGN OF A CIRCULAR HYDRAULIC JUMP,
G. A. Gachechiladze.
Hydrotech Constr, No 10, p 949-951, Oct, 1970. 3 p, 2 fig, 7 ref.

Descriptors: Momentum, *Momentum equation, *Hydraulic jump, *Hydraulic design, Energy dissipation, *Energy dissipators, Foreign research, Jets, Foreign design practices, Equations, Energy equation, Experimental data, Velocity, Integrals, Pressure distribution, Analysis, *Fluid mechanics, *Cylinders.
Identifiers: USSR.

Design procedures for cylinder dissipators of energy have been developed sufficiently for these highly efficient installations to be brought into use. Design of open channel, cylindrical energy-dissipator pools, however, has not been developed to the extent that these structures have been accepted. Design of this type installation may be based on the theory of circular hydraulic jump. Procedures for determining parameters of hydraulic jumps under spatial conditions are not applicable to circular

jumps. An approximate procedure for solving the circular jump problem is presented. (USBR)
W72-00074

PRESSURE DISTRIBUTION ON A CENTER-PIVOT SPRINKLER IRRIGATION SYSTEM,
Department of Agriculture, Mitchell, Nebr., and Department of Agriculture, Fort Collins, Colo.
D. C. Kincaid, and D. F. Heermann.
Trans Amer Soc Agr Eng, Vol 13, No 5, p 556-558, Sept-Oct, 1970. 3 p, 3 fig, 5 tab, 5 ref.

Descriptors: *Pressure distribution, Pressure head, Water application rate, *Sprinkler irrigation, Irrigation, Irrigation engineering, Water requirements, *Irrigation systems, Pumping, *Operating costs, Piplelines, Head losses, Friction coefficient (Hydraulic), Reynolds number, Nozzles, Water distribution (Applied), Discharge (Water).
Identifiers: Friction head, Moody diagram.

The center-pivot irrigation system consists of a sprinkler line approximately 1300 ft long, rotating about a pivot point at one end. The water is introduced at the pivot point and flows outward through the line, supplying each individual sprinkler head. Many center-pivot systems use 6-in. pipe, and with the common 1300-ft system there is a pressure drop of 15 to 20 psi. The relatively high head loss may cause higher than necessary pumping costs and provide higher pressure than required for the smaller sprinklers and lower pressures than required for the large sprinklers. Low pressures result in large waterdrops and a reduction in soil intake. Analyses indicate that pipe sizes should be increased and pressure losses decreased to reduce pumping costs and provide a more uniform pressure distribution. (USBR)
W72-00078

OPEN CHANNEL FLOW,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
D. B. Simons.
In: Introduction to Fluvial Processes, Methuen, London, p 124-145, 1971. 10 fig, 3 tab, 26 ref.

Descriptors: *Open channel flow, *Streamflow, *Sediment transport, *Channel morphology, *Rivers, Hydraulic gradient, Hydrologic data, Flow rates, Boundary layers, Reynolds number, Streamflow forecasting, Water resources development, Alluvial channels, Alluvium.
Identifiers: *Fluvial processes.

The characteristics of open channel flow in rivers are of importance to everyone dealing with water resources, whether from the viewpoint of geomorphology, hydraulics, flood control, navigation, stabilization of water-resources development for municipalities, and industry. The primary variables which affect the form of bed roughness and resistance to flow in sand-bed alluvial channels include: the slope of the energy grade line, depth, physical size of the bed material as related to grain roughness, and fall velocity or effective median fall diameter as related to form resistance. The fall velocity or effective median fall diameter depends on the viscosity and mass density of the water sediment mixture and the mass density, size, and shape of the bed material. The effective median fall diameter is defined as the diameter of a sphere having a specific gravity of 2.65 and a fall velocity in distilled water of infinite extent at a temperature of 24 deg C, equal to the fall velocity of the particle falling alone in any quiescent stream fluid at stream temperature. The regimes of flow and various forms of boundary roughness which can occur in alluvial channels are illustrated. (See also W72-00100) (Woodard-USGS)
W72-00108

HYDRAULIC GEOMETRY,
Sydney Univ. (Australia). Dept. of Geography.
G. H. Dury.
In: Introduction to Fluvial Processes, Methuen, London, p 146-156, 1971. 7 fig, 1 tab, 5 ref.

Descriptors: *Streamflow, *Sediment transport, *Channel morphology, *Hydraulic gradient, Flow rates, Stream gages, Hydrologic data, Boundary layers, Alluvial channels, Alluvium, Sedimentation rates, Sediment yield, Sediment load.
Identifiers: *Fluvial processes.

Hydraulic geometry is the graphical analysis of the hydraulic characteristics of a stream channel. These characteristics include width, depth, slope, discharge, velocity, bed material, and load. Discharge can be regarded as the only fully independent variable. Bed material is an independent variable insofar as its properties are determined by outcropping bedrock in the floor or sides of the channel; amd it can also be regarded as an independent variable, since its properties are controlled by the geology of the catchment. Loose material, however, will be sorted during transit, and will also undergo reduction of size and change of shape. At many stations on many rivers, the suspended load increases as a power function of discharge, increasing as a rule far more rapidly than discharge does. Like the concentration of solution-load, the concentration of suspended-sediment load is apt to be less at times of very high flow than at times of moderate flow, simply because the suspended material is disseminated through a great volume of water. Magnitude-frequency analysis of sediment transport shows that the greatest total transport is effected by discharges of modest magnitude and high frequency, similar to those recognized as responsible for shaping the channels themselves. (See also W72-00100) (Woodard-USGS)
W72-00109

RELATION OF MORPHOMETRY TO RUNOFF FREQUENCY,
Sydney Univ. (Australia). Dept. of Geography.
For primary bibliographic entry see Field 02E.
W72-00112

EXPERIMENTAL STUDY OF CHANNEL PATTERNS,
Colorado State Univ., Fort Collins. Dept. of Geology.
For primary bibliographic entry see Field 02E.
W72-00119

THE QUATERNARY DELTAIC AND CHANNEL SYSTEM IN THE CENTRAL GREAT VALLEY, CALIFORNIA,
California Univ., Davis. Dept. of Geography.
For primary bibliographic entry see Field 02J.
W72-00177

EFFECT OF RAINFALL ON THE RESISTANCE IN CHANNELS WITH SHALLOW FLOW,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Engineering.
K. C. Das, and L. F. Huggins.
Paper No 71-211 presented at the 1971 Annual Meeting of American Society of Agricultural Engineers, Washington State University, June 27-30, 1971. 20 p, 4 fig, 1 tab, 16 ref. OWRR B-003-IND (1).

Descriptors: *Rainfall-runoff relationships, *Small watersheds, *Model studies, *Laboratory tests, *Hydraulic models, Mathematical studies, Theoretical analysis, Reynolds number, Open channel flow, Flow resistance.
Identifiers: *Shallow channel flow.

A laboratory catchment was built to study overland flow aspects of small watershed hydrology. The equipment provided a surface that could be changed to simulate various kinds of slope and surface roughness. The depths of flow at various points on the flow plane and the flow rate were measured directly. Values of the friction factor were determined for three roughnesses and for five slopes varying from 0.01 to 0.05. The value of friction factor for rough surfaces increases at a given rainfall intensity and Reynolds number as the slope increases. On a smooth surface, the rainfall has an effect on the resistance and the relationship between friction factor and Reynolds number deviates from the theoretical ones for flow without rainfall. (Woodard-USGS)
W72-00307

DESIGN CONSIDERATIONS FOR AGRICULTURAL DRAINS ON THE COLUMBIA BASIN PROJECT,
Bureau of Reclamation, Ephrata, Wash.
R. E. Brohl.
Pap No 71-242, Amer Soc Agr Eng 1971 Annu Meet, Pullman, Wash, June 1971. 18 p, 2 fig, 1 tab, 6 ref.

Descriptors: *Irrigated land, *Drainage, Drain spacing, Design, *Water table, Drain tiles, Hydraulic conductivity, Water quality, Saline soils, *Drainage systems, Drainage water, Agriculture, *Waterlogged land, Water users, Hydraulic engineering, Salinity, Groundwater, *Observation wells, Planning, Specific yield, Percolation, Washington.
Identifiers: Columbia Basin Project, Wash.

The Columbia Basin Project, with approximately 500,000 acres of land under irrigation, and an ultimate 1,000,000 acres to be irrigated, has experienced a rise in the ground-water table. The rise has exceeded 150 ft, resulting in large areas being affected by waterlogging and an increase in soil salinity. Many new localities are being affected each year. Designs have been completed for construction of approximately 940 mi of agricultural drains on the project. The soil and cultural and social environments greatly affect the design. How these factors are considered and integrated to complete the design for a drainage system to maintain the land in continued irrigated agricultural production is reviewed. After land has been drained, landowners must leach the acreage to reclaim saline soils and maintain a desirable salt balance acceptable to crops. A water quality monitoring program is important to assure that water suitable for growing crops is delivered to water users, and to provide environmental data. (USBR)
W72-00341

EFFECT OF VALVE POSITION IN A SIDEWALL PORT FILLING SYSTEM, NEWBURGH LOCK, OHIO RIVER: HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
James O. Farrell, and Jackson H. Ables, Jr.
Available from the National Technical Information Service as AD-724 108, $3.00 in paper copy, $0.95 in microfiche. WES Technical report no. H-68-4, Sep 1968. 23 p, 2 ref.

Descriptors: *Dams, *Hydraulic models, *Hydraulic valves, Model studies, *Locks, Flow control.
Identifiers: Hydrostatic tests, Fluid flow, Newburgh Lock, Filling, Emptying, Ohio River.

This report presents results of tests to investigate the effect of the relative position of the filling valves and port manifold on lock filling characteristics in a sidewall port system for a 110- by 1200-ft lock. These tests are supplemental to generalized tests on a lock of this size (Cannelton Main Lock, Ohio River). Pressure and flow distribution data revealed that the most upstream port in the manifold must be at least 6.5 times the culvert height downstream from the filling valve in order to have this port out of the low pressure zone created by the valve. However, with as many as four ports in the low pressure zone no differences in filling time or hawser stresses could be detected from those obtained with the entire manifold downstream from the low pressure zone.
W72-00346

WEBBERS FALLS LOCK AND DAM, ARKANSAS RIVER NAVIGATION PROJECT: HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
John J. Franco, and James E. Glover.
Available from National Technical Information Service as AD-724 107, $3.00 in paper copy, $0.95 in microfiche. WES Technical eport no H-69-N, August 1969. 41 p.

Descriptors: *Dams, *Hydraulic models, Sedimentation, Navigation, *Flood control, *Locks, Spillways.
Identifiers: River currents, Electric power production, Oklahoma, Arkansas River, Webbers Falls Dam.

Webbers Falls Lock and Dam will comprise a nonnavigable dam of 12 gated spillway bays, a 110- by 600-foot lock on the left bank, and a three-unit powerhouse with a discharge capacity of 35,500 cfs on the right bank. A 1:120-scale fixed-bed model was used to determine flood stages at the dam, navigation conditions in the lock approaches, tendency for sediment deposition in the lower lock approach, and magnitude of surges generated in the upper lock approach canal by lock filling, and to develop modifications required to provide satisfactory conditions. Modifications to the original design required to produce satisfactory navigation conditions in the approaches to the lock were developed and flow conditions through the spillway were improved. In general, results have indicated: Realignment of the entrance to the upper lock approach canal would be required t eliminate hazardous conditions for downbound tows attempting to enter the canal. Ports would be required in the upper guard wall to reduce crosscurrents near the entrance to the upper lock approach canal and to reduce surges resulting from lock filling operations. Surges would develop in the upper lock approach canal from lock filling operations. Magnitude of the surge could be reduced so that it would have no serious effect on navigation with ports in the upper guard wall and a surge basin near the lock. Water-surface elevations at the dam embankment to the left of the lock could be lowered by structures designed to eliminate overbank flow toward the embankment and improve the alignment of currents approaching the spillway. Sediment below the dam would be moved into the lower approach channel and could produce shoaling. Size of the surge basin and length of the upper guard wall could be reduced without any appreciable effect on navigation. The amount of excavation in the approach to the spillway could be reduced appreciably without affecting flow through the spillway.
W72-00347

ANALYSIS OF WAVE RECORDS,
Army Coastal Engineering Research Center, Washington, D.C.
For primary bibliographic entry see Field 07B.
W72-00350

WAVES GENERATED BY PISTON-TYPE WAVEMAKER,
Army Coastal Engineering Research Center, Washington, D.C.
O. S. Madsen.
Proceedings, 12th Coastal Engineering Conference, Wash. DC, Sep, 1970, p 589-607 and CERC reprint R4-71.

Descriptors: *Waves (Water), *Mathematical models, Hydrodynamics, Hydraulics.
Identifiers: *Wavemakers.

When a wavemaker generates a finite number of waves, it has been found that one of the first and one of the last waves in such a burst is considerably larger than the average. A mathematical model, based on the linearized governing equations, is used for the particular problem of the waves generated by a sinusoidally moving piston-type wavemaker starting from rest. Theoretical results for the magnitude of the large wave relative to the average agree fairly well with experiments; however, the actual wave height is smaller in the experiments than predicted by theory. It is shown, by extending the classical wavemaker theory to second order, that finite amplitude effects do not offer an explanation. However, pistons rarely fit the tank dimensions exactly, and an approximate evaluation indicates that the discrepancy between predicted and observed wave heights can be attributed to the effects of leakage around the piston.
W72-00351

COMPARISON OF PRESSURE AND STAFF WAVE GAGE RECORDS,
Army Coastal Engineering Research Center.
For primary bibliographic entry see Field 07B.
W72-00352

JONES BLUFF LOCK AND DAM, ALABAMA RIVER NAVIGATION PROJECT: HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
John J. Franco, James E. Glover, and Bertrand K. Melton.
Available from the National Technical Information Service as AD-723 943, $3.00 in paper copy, $0.95 in microfiche. WES technical report H-69-17, Dec 1969. 35 p.

Descriptors: *Dams, *Hydraulic models, *Rivers, *Navigation, *River flow, *Locks (Waterways), Test procedures, Design criteria.
Identifiers: Alabama, Jones Bluff Dam, Alabama River.

Jones Bluff Lock and Dam is proposed for construction on the Alabama River about 245 miles above its junction with the Tombigbee River to form the Mobile River in south central Alabama about 45 miles above Mobile Bay. The project, which will provide a navigable pool for 75 miles upstream to the mouth of the Coosa River, comprises a nonnavigable gated dam with eleven 50-ft-wide by 35-ft-high tainter gates, an 84- by 600-ft lock on the left bank with a maximum lift of 45 ft, and a four-unit powerhouse on the right bank with a maximum discharge capacity of 35,200 cfs. A 1:100-scale, fixed-bed model reproducing approximately 3.6 miles of the Alabama River was used to determine navigation conditions in the lock approaches, determine effects of powerhouse releases, and develop modifications required to provide satisfactory navigation conditions. In general, the results have indicated the following: Modification of the dredging for the upper approach channel and ports in the upper guard wall would be required to provide satisfactory navigaton conditions in the upper approach to the lock. A large eddy extending into the lower lock approach would develop with powerhouse flow and no flow through the spillway. Because of the eddy, tows would experience considerable difficulty in approaching the guide wall. The difficulties can be eliminated with a wall or dike extension to the lower guard wall. The danger of small boats being moved into the powerhouse tailrace can be minimized with a 200-ft wall between the powerhouse tailrace and stilling basin. The amount of rock excavation can be reduced appreciably without seriously affecting flow conditions downstream of the dam.
W72-00359

NAVIGATION CONDITIONS IN FORT SMITH REACH, ARKANSAS RIVER. HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
John J. Franco, and Louis J. Shows.
Available from the National Technical Information Service as AD-723 975, $3.00 in paper copy, $0.95 in microfiche. WES technical report H-68-7, Sep 1968. 51 p.

Descriptors: *Channel improvement, *Locks (Waterways), River flow, *Dams, *Hydraulic models, *Rivers, Navigation, Levees, Sedimentation.
Identifiers: River currents, Test methods, Arkansas, Arkansas River, Poteau River, Waterways (Transportation).

The Fort Smith reach of the Arkansas River, located in the Lock and Dam No. 13 pool, includes the mouth of the Poteau River and is crossed by two bridges 850 ft apart. An undistorted 1:120-scale, semifixed-bed model reproducing approximately 4 miles of the Arkansas River and adjacent overbank and the lower 2 miles of the Poteau River was used to determine the regulating structures and modifications required to develop a channel of project dimensions, and the modifications required to the existing bridges to provide satisfactory navigation conditions through the reach. Results of the investigation indicate that: (1) The bridge spans should be modified to provide additional clearance and the navigation channel through the bridges should be maintained along the right bank. (2) Normal flow from the Poteau River would have little effect on navigation through the bridges downstream. Overflow from the Arkansas River into the Poteau River channel combined with Poteau River flow could produce serious crosscurrents at the mouth of the Poteau River and would tend to increase shoaling at that point. (3) Modifications would be required in the regulating structures along the right bank just upstream of the mouth of the Poteau River and along the left bank to develop satisfactory channel dimensions through the reach.
W72-00360

MECHANICS OF FLOW FROM STRATIFIED RESERVOIRS IN THE INTEREST OF WATER QUALITY: HYDRAULIC LABORATORY INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 05F.
W72-00361

NAVIGATION CONDITIONS AT LOCK AND DAM NO. 3, ARKANSAS RIVER, ARKANSAS AND OKLAHOMA, HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experment Station, Vicksburg, Miss.
John J. Franco, and Cody D. McKellar.
Available from the National Technical Information Service as AD-723 973, $3.00 in paper copy, $0.95 in microfiche. WES Technical report no H-68-8, September 1968. 177 p.

Descriptors: *Locks (Waterways), Spillways, *Dams, Hydraulic models, River currents, Navigation, Sedimentation.
Identifiers: Arkansas, Oklahoma, Arkansas River, Channel improvements, Dredging.

Lock and Dam No. 3 will consist of a 110- by 600-ft lock and a 1260-ft-long, gated, nonnavigable dam. A movable-bed model, reproducing 12.8 miles of the Arkansas River to a horizontal scale of 1:120 and vertical scale of 1:80, was used to determine: suitability of the proposed site for the structures; adequacy of proposed regulating works upstream and downstream including a proposed cutoff; modifications required to provide adequate channel dimensions and safe navigation conditions with minimum maintenance; and effects of various cofferdam and diversion plans. Special studies were also conducted with the model converted to a 1:120 scale (undistorted). Test results indicated that satisfactory navigation conditions can be developed with the lock and dam at the proposed site. Development of channel dimensions was affected considerably by the tendency of the channel to meander within the long, straight reach at the site and the effects of dam gate operation on sediment movement. Regulating structures that provided adequate channel dimensions under typical

flow conditions were developed, except in the lower lock approach channel. A satisfactory plan for elimination of shoaling in the lower lock approach was not developed. Increasing the capacity of the ports in the upper guard wall would eliminate hazardous crosscurrents in the upper lock approach and reduce scour near the end of the upper guard wall. A fill along the left overbank would prevent overbank flow moving toward the spillway from seriously affecting downbound tows approaching the lock. In cofferdam tests, water-surface elevations along the upstream side, location of maximum scour, and scour pattern were determined together with the factors affecting these conditions.
W72-00362

EXPANSION AND REVISION OF KAWAIHAE HARBOR, HAWAII: HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
Charles W. Brasfield, and Claude E. Chatham, Jr.
Available from the National Technical Information Service as AD-723 937, $3.00 in paper copy, $0.95 in microfiche. WES Technical report no 2-806, December 1967. 68 p, 6 ref.

Descriptors: *Breakwaters, *Hydraulic models, *Harbors, Ocean waves, Test procedures.
Identifiers: Hawaii, Harbor models, Ocean currents, Kawaihae Harbor.

A 1:100-scale model of Kawaihae Harbor, Hawaii, and sufficient offshore area to permit generation of the required test waves was used to investigate the arrangement and design of certain proposed harbor improvements with respect to wave action and to determine current directions and velocities in the navigation channel. The proposed harbor improvements consisted of (a) widening the entrance channel and enlarging the turning basin; (b) dredging a small-craft basin in the rear of the harbor; and (c) constructing a protective wave absorber in front of the small-craft harbor. A 52-ft-long wave machine and electrical wave-height measuring and recording apparatus were utilized in model operation. Base tests were conducted with existing prototype conditions installed in the model. Results of tests involving the various improvement plans were compared with base test results to determine the effectiveness of the respective plans. It was concluded from the test results that (a) very little improvement of the wave climate in the deep-draft harbor can be effected by any of the plans tested, (b) the proposed wave absorber in the rear of the harbor will afford adequate protection to the small-craft basin, and (c) the proposed harbor dredging can be effected without materially worsening the existing wave climate in the deep-draft harbor.
W72-00364

NAVIGATION CONDITIONS AT LOCK AND DAM NO. 7, ARKANSAS RIVER: HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
John J. Franco, and Cody D. McKellar.
Available from the National Technical Information Service as AD-723 967, $3.00 in paper copy, $0.95 in microfiche. WES Technical report H-69-3, February 1969. 57 p.

Descriptors: *Locks (Waterways), *Dams, *Hydraulic models, *Rivers, Navigation, River currents, Flow.
Identifiers: Test methods, Arkansas, Arkansas River, Little Rock (Arkansas).

Lock and Dam No. 7 will consist of a 110- by 600-ft lock on the right bank and a 980-ft-long, nonnavigable dam of 14 gated spillway bays. A 1:120-scale, semifixed-bed model, reproducing about 7 miles of the Arkansas River, adjacent overbank areas, the lock and dam, and other structures that might affect flow conditions, was used to study navigation conditions in the lock approaches, the design of the upstream guard wall, and the location and design of any training works needed to improve navigation conditions and distribution of flow through the spillway and along the overbank. A self-propelled model towboat and tow were used to study current effects on navigation passing through the locks and through the proposed I-430 Bridge to be located about a mile upstream of the lock and dam. Results of the investigations indicated: (a) Downbound tows would have difficulty in approaching the lock with the upper lock approach as originally designed because of current alignment; no difficulties were found in the lower lock approach. Satisfactory navigation conditions could be developed in the upper approach by revising the extent and placement of the right bank revetment. (b) Distribution of flow through the three dam gates near the lock, unsatisfactory with the original design, could be improved by revision of the right bank revetment and end of the upper guard wall. (c) Navigation hazards will be created by the elevation of the right bank of the upper approach channel, the elevation of the revetment along the left bank of the bend upstream of the proposed I-430 Bridge, and the navigation span of the bridge; however, these hazards can be minimized by careful navigation.
W72-00365

DESIGN FOR EXPANSION OF PORT SAN LUIS, CALIFORNIA; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
Claude E. Chatham, Jr., and Charles W. Brasfield.
Available from the National Technical Information Service as AD-723 966, $3.00 in paper copy, $0.95 in microfiche. WES Technical report no H-69-6, April 1969. 65 p, 11 ref.

Descriptors: *Breakwaters, Hydraulic models, *Harbors, Ocean waves, Test procedures.
Identifiers: California, San Luis Obispo Harbor, San Luis Obispo (California), Port San Luis.

A 1:100-scale model of Port San Luis (formerly known as San Luis Obispo Harbor), California, and sufficient offshore area to permit generation of the required test waves was used to investigate the arrangement and design of certain proposed harbor improvements with respect to wave action. The proposed harbor improvements consisted of (a) an 1150-ft-long south breakwater extending east-northeast from Smith Island, with a 370-ft-long breakwater wing extending northward from this structure; (b) a 3515-ft-long detached breakwater with a north-northeast to south-southwest alignment, located approximately 500 ft seaward of the Port San Luis Wharf; (c) a 1300-ft-long north breakwater extending from a point on shore southward toward the north end of the detached breakwater; and (d) development of the inner harbor by constructing landfill areas and boat slips for the anchorage of small pleasure craft. A 60-ft-long machine and electrical wave height measuring and recording apparatus were utilized in model operation. Base tests were conducted with existing prototype conditions installed in the model. Results of tests involving the various improvement plans were compared with base test results to determine the relative effectiveness of the respective plans. Of the plans tested, the optimum configuration appears to be that designated as plan 12. It was concluded from the test results that (a) the proposed 1300-ft-long north breakwater and the 370-ft-long south breakwater wing can be replaced by revetted fills; (b) the length of the south breakwater should be increased by 400 ft; (c) the northern end of the proposed harbor should be redesigned to prevent excessive wave heights in that area; (d) the optimum harbor improvement plan (plan 12) will provide sufficient protection to the inner harbor from storm waves most of the time; however, when exceptionally high storm waves from the south-southwest deepwater direction occur simultaneously with high tide conditions, wave heights in the northern part of the harbor will reach magnitudes of approximately 3 ft; and (e) installation of the proposed breakwater and other harbor structures will not adversely affect wave conditions at the Union Oil Company Pier.
W72-00366

WAVE ACTION IN MISSION BAY HARBOR, CALIFORNIA: HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
James W. Ball, and Charles W. Brasfeild.
Available from the National Technical Information Service as AD-723 968, $3.00 in paper copy, $0.95 in microfiche. June, 1969. 50 p, 8 tab, 16 photo, 11 plate, 18 ref.

Descriptors: *Breakwaters, *Hydraulic models, *Harbors, Ocean waves.
Identifiers: Storms, Harbor models, Test methods, Mechanical drawings, Photographs, Tables, California, Mission Bay (California), Mission Bay Harbor.

A hydraulic model investigation of the wave-action problems in Mission Bay Harbor was conducted to develop and test several plans of improvement proposed for reducing wave heights within Quivera Basin and Glen Rick Cove to a satisfactory level. The 1:100-scale model, molded in cement mortar, reproduced the portion of the harbor requiring remedial action, and sufficient coastline and offshore bathymetry to permit accurate simulation of storm-wave attack in the area. A 60-ft-long wave machine and electrical wave height measuring and recording apparatus were utilized in model operation. It was concluded that modifying the curved portion of the south bank of the entrance channel to a series of right-angled steps would effectively provide adequate protection to Quivera Basin and Glen Rick Cove during attack by short-period storm waves.
W72-00367

ANSONIA-DERBY LOCAL PROTECTION PROJECT, NAUGATUCK AND HOUSATONIC RIVERS, CONNECTICUT: HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
Glenn A. Pickering, and T. E. Murphy.
Available from the National Technical Information Service as AD-723 969, $3.00 in paper copy, $0.95 in microfiche. WES Technical report no H-69-4, April 1969. 43 p.

Descriptors: *Levees, *Hydraulic models, Rivers, Flow, *Flood control, Riprap.
Identifiers: Test methods, Connecticut, Naugatuck River, Housatonic River, Arsonia (Connecticut), Derby (Connecticut).

The Ansonia-Derby project will provide protection for the cities of Ansonia and Derby, Conn., from flooding of the Naugatuck and Housatonic Rivers. The proposed plan for containing the river flows requires about 13,300 ft of earth dikes and 6850 ft of floodwalls, extending about 2-1/2 miles along the Naugatuck River and 2000 ft along the Housatonic River. A 1:120-scale model was used in the investigation and reproduced approximately 4000 ft of the Housatonic River and 16,000 ft of the Naugatuck River. Tests were concerned with flow conditions at bridges and channel transitions, water-surface elevations for selection of grades for the dikes and floodwalls, and velocities for use in the design of riprap to be placed on the river side of the dikes and in portions of the channel. Flow conditions were poor and water surfaces were higher than expected in the upper reach of the project; however, a satisfactory design was developed for this area. Water-surface profiles and bottom velocities were obtained with the final design for both the design discharge and the capacity flow.
W72-00368

OUTLET WORKS FOR BELTZVILLE DAM, POHOPOCO CREEK, PENNSYLVANIA: HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
Edwin S. Melsheimer.
Available from the National Technical Information Service as AD-723 942, $3.00 in paper copy, $0.95 in microfiche. WES Technical report no H-69-18, December 1969. 45 p.

Descriptors: *Dams, *Hydraulic models, Flow, Test procedures, *Outlet works, *Stilling basins, *Intake structures, Flood control.
Identifiers: Pennsylvania, Beltzville Dam, Pohopoco Creek.

Model investigation of the outlet works for the Beltzville Reservoir was concerned with the overall performance of both the flood-control and selective withdrawal facilities of the intake structure. Ths study was conducted in a 1:20-scale model of the outlet works which reproduced a portion of the approach area, the intake structure, the outlet conduit, and the hydraulic-jump type stilling basin. Modifications of the proposed outlet structure were required to provide effective regulation of flood-control releases up to about 2000 cfs and water-quality releases ranging from 35 to 300 cfs (summer and winter flows). Subatmospheric pressures that were detected in the original design water-quality conduit in the area below the control gate were eliminated by reducing the central angle of the elbow above the control gate from 90 to 82 deg and placing the gate chamber and downstream chute on an 8-deg slope (type 2 design). Pressures were positive throughout the flood-control conduit for all full flow conditions. With gate openings equal to or less than 50 percent and partial flow conditions, the discontinuity due to the intersection of the horizontal gate section and sloping conduit produced subatmospheric pressures in the immediate area of the intersection. Rounding or streamlining the area of intersection in the prototype structure should result in acceptable pressure conditions. Performance of the original stilling basin was satisfactory and the height of the basin training walls was sufficient to prevent overtopping. Protective stone is not required in the exit channel since it will be excavated in sound rock.
W72-00369

WAVE ACTION AND BREAKWATER LOCATION, NOYO HARBOR, CALIFORNIA: HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
Howard B. Wilson.
Available from the National Technical Information Service as AD-723 951, $3.00 in paper copy, $0.95 in microfiche. WES Technical report no 2-799, November 1967. 136 p, 7 ref.

Descriptors: *Breakwaters, *Hydraulic models, Ocean waves, Storms, Ocean currents, Jetties, Shore protection, Test procedures.
Identifiers: California, Noyo Harbor.

The entire Noyo Cove at the mouth of Noyo River, the lower 0.8 mile of Noyo River, and sufficient coastline and offshore bothymetry to permit accurate simulation of storm-wave attack in the area were reproduced in a 1:100-scale hydraulic model, equipped with wave-generating and wave-height-measuring devices, used to predict the efficacy of several proposed breakwater plans in providing suitable protection to sea-going lumber barges, which would be moored along a proposed inner-harbor pier, during periods of storm-wave attack. A breakwater plan consisting of a south arm originating near the south limit of Noyo Cove and extending about 1900 ft in a NNW direction, plus a companion arm originating along the bluffs of the north limit of the cove and extending about 320 ft in a WSW direction to provide a navigation entrance about 400 ft wide, would provide the desired protection to the harbor except for a few hours a year when peak storm-wave attack from the NW directions occurs in unison with the higher-high-water cycle of the tide. During these short periods of severe wave action, loading and unloading operations inside the harbor would be subject to some delay.
W72-00370

OUTLET WORKS FOR NEW HOPE RESERVOIR CAPE FEAR RIVER BASIN, NORTH CAROLINA: HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
Edwin S. Melsheimer, and N. R. Oswalt.
Available from the National Technical Information Service as AD-723 941, $3.00 in paper copy, $0.95 in microfiche. WES Technical report no H-69-14, October 1969. 46 p.

Descriptors: *Outlet works, *Dams, *Hydraulic models, Flow, Hydraulic systems, *Stilling basins, Test procedures, Flood control, Design criteria.
Identifiers: New Hope Reservoir (North Carolina), Cape Fear River.

Model investigation of the outlet works for the New Hope Reservoir was initially concerned with verification and improvement of the hydraulic design of the intake structure, conduit, and stilling basin. Subsequent tests involved observations of the effectiveness of the multilevel intakes in providing selective withdrawal of flow from the epilimnion or upper stratum of a stratified reservoir. The study was conducted in a 1:20-scale model of the outlet works which reproduced a portion of the approach area, the intake structure, the outlet conduit, the hydraulic-jump type stilling basin, and approximately 800 ft of exit channel. The proposed intake structure provided effective regulation of flood-control releases as well as those which are desired to provide quality water downstream during both summer and winter. However, certain operational procedures are necessary to prevent dangerous subatmospheric pressures in the throat section of the water-quality system. Flow conditions in the original conduit intakes, throughout the flood-control facilities, and downstream to the conduit outlet were satisfactory with pressure conditions remaining positive for all discharges with little or no fluctuation. There was no tendency for structural vibration with either flood-control or water-quality flows. Performance of the original design stilling basin was unacceptable as unstable hydraulic action and eddy formation resulted in very turbulent basin conditions with little or no energy dissipation. Raising the elevation of the basin and lengthening and modifying the transition section (types 2 and 3 basins) resulted in adequate, if not ideal, performance. Single gate operation produced unbalanced flow in the basin; however, as single gate operation is rarely necessary, types 2 and 3 basins are considered acceptable for prototype construction. It was determined that riprap protection is required on both banks of the exit channel.
W72-00371

SPILLWAY FOR KAYSINGER BLUFF DAM OSAGE RIVER, MISSOURI, HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
G. A. Pickering.
Available from the National Technical Information Service as AD-723 982, $3.00 in paper copy, $0.95 in microfiche. WES Technical report no 2-809, Jan 1968. 48 p.

Descriptors: *Spillways, *Stilling basins, *Dams, *Hydraulic models, River flow, Hydrostatic pressure, Riprap, Test procedures.
Identifiers: Missouri, Osage River, Kaysinger Bluff Dam.

Tests were conducted on a 1:60-scale model of the Kaysinger Bluff Dam spillway to determine the discharge characteristics of the spillway, stilling basin performance, flow conditions in the outlet channel, and the adequacy of various sizes of riprap in the outlet channel. The spillway consisted of an ogee crest with four 40-ft-wide by 47.3-ft-high tainter gates and a hydraulic-jump type stilling basin. The discharge capacity of the original design spillway was slightly less than expected; however, the capacity was increased by increasing the radius of the abutments. An unstable surging of flow that occurred on the upstream side of the spillway gates with the original design during operation with large partial gate openings was eliminated by decreasing the length of the gate piers upstream from the gates. Although the original design stilling basin performed satisfactorily, a more economical and efficient design was developed. The discharges at which failure of the riprap placed on the side slopes of the outlet channel will occur were determined.
W72-00372

NAVIGATION CONDITIONS AT HANNIBAL LOCKS AND DAM, OHIO AND WEST VIRGINIA: HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
John F. Franco, and James E. Glover.
Available from the National Technical Information Service as AD-723 944, $3.00 in paper copy, $0.95 in microfiche. WES Technical report no 2-796, Sept 1967. 40 p.

Descriptors: *Locks (Waterways), *Gates, *Dams, *Hydraulic models, Navigation, River flow, Test procedures.
Identifiers: Ohio, West Virginia, Hannibal Dam, Ohio River.

Hannibal Locks and Dam comprises a nonnavigable gated dam with eight 110-ft-wide by 29-ft-high tainter gates, a 110-ft-long fixed-crest weir connecting the spillway to the left bank, and two parallel locks with clear chamber dimensions of 110 by 1200 ft and 110 by 600 ft, on the right bank, and a maximum lift of 21 ft. A 1:120-scale, fixed-bed model, reproducing approximately 3.8 miles of the Ohio River, was used to determine flow conditions in the lock approaches and to develop modifications required to provide satisfactory navigation conditions. Results of the investigation revealed that because of the alignment of the channel, velocities in the upper approach would be high and downbound tows with limited power might experience difficulty in making the approach to the lock during high flows. Velocities in the upper approach could be reduced by excavation of the right bank upstream of the lock or by the construction of submerged dikes along the existing right bank. Navigation conditions would be better with the excavation of the right bank than with only submerged dikes along the bank since the excavation would provide lower current velocities along the bank and greater maneuver area landward of the guard wall. Ports in the upper guard wall with sufficient capacity to pass most of the flow intercepted would be required to prevent crosscurrents from developing near the end of the wall. The dam gates could be so operated as to improve navigation conditions in the lock approach during controlled river flows. No serious navigation difficulties were indicated in the lower lock approach.
W72-00373

8C. Hydraulic Machinery

ANALOG ANALYSIS OF WATER DISTRIBUTION NETWORKS,
Kentucky Univ., Lexington.
For primary bibliographic entry see Field 07A.
W72-00071

DEVELOPMENT OF AN HVDC SOLID STATE BACK TO BACK ASYNCHRONOUS TIE,
Canadian General Electric Co. Ltd., Toronto (Ontario).
C. M. Stairs.

Pap, Manitoba Power Conf EHV-DC, June 1971. 19 p, 8 fig, 11 ref.

Descriptors: *Transmission (Electrical), *Direct current, *Converters (Electrical), *Interconnected systems, *Extra high voltage, Alternating current, History, Electrical equipment, Electrical design, Coordination, Thyristors, Power transformers, Control systems, Insulation, Foreign design practices.
Identifiers: *Eel River Project, Can, Hydro-Quebec, Can, *Solid state devices, Layout, Canada.

The 320-mw, 80-kv, solid-state, back-to-back asynchronous converter station being constructed at Eel River in New Brunswick, Canada, and scheduled for operation in 1972, represents a significant advance in hvdc transmission technology. The converter station will be the first major high-voltage, solid-state conversion facility in the world and the first in which the electrical and mechanical flexibility of a modular thyristor equipment concept has been used to simplify the system and building designs and to provide a scientifically calculated availability higher than expected for more conventional apparatus such as power transformers. Studies of a conventional a-c interconnection between the Hydro-Quebec and New Brunswick power systems indicated the existence of an unstable condition which could not be remedied by any practical means. If a tie between the 2 systems were to be constructed, a d-c link would be necessary for independent operation without regard to angular positions or frequencies of the systems, that is, the tie must be asynchronous. The history of the Eel River Project is given, and principal features of the system, equipment designs, and the overall layout selected for the converter terminal are described. (USBR)
W72-00338

NELSON RIVER HVDC TRANSMISSION LINE TOWERS,
Dominion Bridge Co. Ltd., Winnipeg (Manitoba).
D. L. T. Oakes.
Pap, Manitoba Power Conf EHV-DC, Winnipeg, Can, June 1971. 17 p, 5 fig, 3 tab, 3 ref.

Descriptors: *Transmission lines, *Guyed towers, Transmission towers, *Direct current, *Structural design, Economics, Wind pressure, Safety, Temperature, Reliability, Safety factors, Specifications, Foreign design practices.
Identifiers: *Bipolar transmission lines, Tower failures, Canada, Nelson River, Canada, Tower height.

A major problem in developing the Nelson River power potential was the transmission of power from the generating station to the Southern Canadian load centers near Winnipeg. This involved 555 mi of harsh terrain, extreme weather and temperature conditions, and very difficult access to the route. Economics contributed to the decision that d-c be used as the mode of transmission. Extensive studies established the tower types to be used, the most economical tower heights and spans, and the required loading conditions to be considered. Two parallel bipolar transmission lines have been built on the same right-of-way with a spacing varying from 212 ft to 247 ft between lines. The double line safeguards against possible lengthy interruption and is necessary to meet design criteria that the line be able to withstand a fault on any one element, including that resulting from an ocassional tower failure. Ice and wind loading data for the line, general design parameters for tower members, and tower design data are given. (USBR)
W72-00339

HVDC TRANSMISSION CONTROL SCHEMES.
Manitoba Univ., Winnipeg.

Pap, Manitoba Power Conf EHV-DC, Winnipeg, Can, June 1971. 33 p, 12 fig, 9 ref.

Descriptors: *Transmission (Electrical), *Direct current, Power system stability, *Control, *High voltage, Extra high voltage, Inverters, Load-frequency control, Converters (Electrical), Control systems, Alternating current, Foreign design practices, Reliability, *Conversion, Thyristors, Electrical faults, Electric power, *Protection (Electrical).
Identifiers: Canada, Solid-state valves, Solid state devices.

Hvdc transmission can be subdivided into 3 major categories: (1) multiterminal d-d links, (2) 2-terminal or point-to-point d-c links, and (3) back-to-back d-c links. Various control schems for application to hvdc transmission are described and compared. The basic theory of d-c control is explored to provide a better understanding of control functions, selection of schemes, optimization, reliability, and protection. Conversion equipment and controls are the 2 most important aspects in hvdc transmission. Conversion is the heart of the system, and control is responsible for supervision of the proper functioning of the system. Controls in conjunction with other facilities provide transmission system protection. In most cases the control functions, proper operation and protection, are inseparable. Major parts of the control scheme are: (1) power flow control or master-controller, (2) pole control or current-controller (for rectifier) or extinction angle-controller (for inverter), and (3) bridge control. (USBR)
W72-00342

8D. Soil Mechanics

COOLING TOWERS,
R. D. Woodson.
Sci Amer, Vol 224, No 5, p 70-78, May 1971. 9 p, 12 fig, 1 tab.

Descriptors: *Cooling towers, Cooling systems, *Cooling water, Thermal pollution, Heat exchangers, *Thermal powerplants, Coolants, Water vapor, Air circulation, Air temperature, Fans, *Evaporation, Design, Climatic data, Recirculated water, Costs.
Identifiers: Thermoelectric tenerators, Wet bulb thermometer method.

In a modern steam-turbine electric powerplant, about 40% of the heat energy put into the system by burning fuel emerges from the plant as electrical energy. In the majority of such plants, the remaining heat is removed by drawing water from a stream, lake, or body of salt water, running it through the plant once, and then returning the heated water to its source. This type cooling is becoming less acceptable as questions arise about the adequacy of cooling water supplies and about the biological effects of warming natural bodies of water. As an alternative, air is a good coolant and a few plants are cooled by the dry system. However, large volumes of air must be moved and elaborate heat-exchange surfaces must be provided. A more practical alternative is the wet cooling tower where air and water serve as coolants. In such a tower, the cooling water being circulated through a plant falls through a draft of air and heat is carried away mostly by evaporation. The rest of the water is collected at the bottom of the tower and returned to the cooling cycle. The use of cooling towers can be expected to increase in new generating plants. The mechanical-draft wet-type cooling tower will be used most because it is more economical for nearly all applications. (USBR)
W72-00337

ESTIMATING SOIL PERMEABILITY RATES,
Harza Engineering Co., Chicago, Ill.
For primary bibliographic entry see Field 02G.
W72-00345

TURKEY CREEK CHANNEL STABILITY STUDIES, FARWELL UNIT, MIDDLE LOUP DIVISION, PICKSLOAN MISSOURI BASIN PROGRAM.
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.

Available from the National Technical Information Service as PB-199 291, $3.00 in paper copy, $0.95 in microfiche. Reclamation report REC-ERC 71-9, January 1971. 11 p.

Descriptors: *Cohesive soils, *Channel morphology, Drainage, Compressive strength, Loess, Channel improvement, Floods.
Identifiers: *Channel stabilization, Alluvim.

The Turkey Creek channel stability studies were made to analyze the stability of man-made channels in cohesive soils and to establish criteria for the design of future channels. One natural and 3 channelized test reaches were established from which hydraulic and soil property data were collected. Unconfined compressive strength of the soils and width-depth ratios appear to offer the best measure of channel stability. Degree of vegetation and antecedent moisture conditions also appear to affect the channel stability, but were not evaluated in this study. The unconfined compressive strength of the soil seems to offer the best basis for design of drainage channels in loessial soils. Additional data are required to evaluate channel stability of these channels for flood peaks having recurrence intervals greater than 5 yr.
W72-00376

8E. Rock Mechanics and Geology

STUDY OF NATURAL STRESS DISTRIBUTION IN ROCK MASSIFS WITH THE HELP OF SEISMIC-ACOUSTIC METHODS,
All-Union Designing, Surveying and Scientific Research Inst. Hydroproject, Moscow (USSR).
A. I. Savich, V. I. Koptev, and E. A. Grioriants.
Pap, Proc Sec Congr Int Soc Rock Mech, Vol 1, Themes 1-2, Belgrade, Yugoslavia, Sept, 1970. 9 p, 4 fig, 2 tab, 11 ref.

Descriptors: *Rock properties, *Rock mechanics, Rock tests, Laboratory tests, *Elastic waves, Deformation, Velocity, *Stress analysis, Seismic investigations, Stress distribution, Stress waves, Engineering geology, *Acoustics, Field investigations, Analysis, Graphical analysis, Foreign research.
Identifiers: Geotechnics, USSR.

The main parameters governing the relationship of elastic wave velocities and stresses acting in rock massifs are described. To determine stresses in rock, the values of elastic wave velocities before and during application of pressure and the characteristics of interrelations between the velocities and stresses must be known. Results of comprehensive field and laboratory studies to determine the relationship of stresses and elastic wave velocities are presented. Generalized curves combining experimental data allow obtaining calibration curves intended for determination of stress by the 2 parameters elastic wave velocity before and during application of pressure. A method to obtain values of elastic wave velocities by ultrasonic measurement is proposed. The results obtained allow for calculating components of shear in various directions and determining the total shear vector. Absolute value of stresses and the method of distribution found by seismic-acoustic studies compare favorably with the results of stress studies by the method of unloading. (USBR)
W72-00079

AN AUTOMATED TEST FACILITY FOR ROCK MECHANICS RESEARCH,
Pennsylvania State Univ., University Park.
H. R. Hardy, Jr., R. Stefano, and E. J. Kimble, Jr.
Int. J Rock Mech Mining Sci, Vol 8, No 1, p 17-28, 1971. 16 p, 10 fig, 12 ref, disc.

Descriptors: *Test facilities, *Electronic equipment, *Rock mechanics, Experimental data, Laboratory equipment, Digital systems, Laboratories, *Digital recording, Monitoring, Automation, Building design, Mechanical properties, Research equipment, Research facilities, *Data collection systems, Physical properties, Research and development, Instrumentation.
Identifiers: Plotters.

The design, development, and operation of a test facility in the Department of Mining Rock Mechanics Laboratory at Pennsylvania State University are described. The facility contains an electronically programmed electrohydraulic loading system capable of developing compressive and tensile loads up to 200,000 and 120,000 lb, respectively. Programming facilities are available to perform creep, stress relaxation, and fatigue studies, and experiments under controlled rates of load, strain, and deformation. Two hydraulic power supplies are included for developing confining and pore (internal) pressures during triaxial loading experiments. Facilities available for monitoring strains, loads, pressures, and temperatures include: (1) a digital data acquisition system capable of monitoring up to 200 channels of experimental data at a rate of 20 channels/sec, and (2) 3 dual-channel strip chart recorders and an X-Y plotter for continuous recording of selected variables. Although considerable time and effort have been expended in designing the facility, the convenience and reliability inherent in such a facility should accelerate rock mechanics research manyfold. (USBR)
W72-00344

8F. Concrete

OPTIMUM SAMPLE SIZES FOR CONCRETE CYLINDER TESTS USING INFORMATION THEORY,
Stanford Univ., Calif.
F. Webster.
J Amer Concr Inst, Proc, Vol 68, No 5, p 373-379, May, 1971. 7 p, 5 fig, 4 tab, 9 ref, append.

Descriptors: *Information theory, Optimization, Building codes, Costs, Probability theory, *Quality control, Sampling, Tests, Concrete control, *Concrete technology, *Concrete tests, Concretes, Compressive strength, Reinforced concrete.

Information theory and Bayesian decision statistics are used in conjunction with a simple loss function to study the optimum size for concrete test cylinders. Calculating the expected loss for an increasing number of samples is simple when the parameters of the loss function are found. At some point the expected loss will become minimum and the optimal sample size will be found. Results are presented in figures of optimal sample size versus replacement costs and in tables of probabilities associated with different optimum sample sizes. (USBR)
W72-00076

8G. Materials

MODEL LAW TO IMPROVE DAM SAFETY,
USCOLD Committee on Model Legislation for State Safety of Dams, New York.
For primary bibliographic entry see Field 06E.
W72-00073

GEOTHERMAL EXPLORATION,
For primary bibliographic entry see Field 02F.
W72-00077

AN AUTOMATED TEST FACILITY FOR ROCK MECHANICS RESEARCH,
Pennsylvania State Univ., University Park.
For primary bibliographic entry see Field 08E.
W72-00344

8I. Fisheries Engineering

THE FISHERY POTENTIAL OF FOUR AQUATIC ENVIRONMENTS CREATED BY INTERSTATE ROUTE 91 CONSTRUCTION IN MASSACHUSETTS,
Massachusetts Univ., Amherst.
For primary bibliographic entry see Field 04C.
W72-00135

HARVESTING COASTAL PELAGIC FISHES WITH ARTIFICIAL LIGHT AND PURSE SEINE,
D. A. Wickham.
Commer Fish Rev. 33 (1): 1971. 30-38. Copyright 1971, Biological Abstracts, Inc.
Identifiers: Artificial, Catch, Coastal, Fishes, Harvesting, Light, Pelagic, Purse, Seine, Statistics.
W72-00533

09. MANPOWER, GRANTS AND FACILITIES

9D. Grants, Contracts, and Research Act Allotments

NOTES ON SEDIMENTATION ACTIVITIES, CALENDER YEAR 1970.
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 02J.
W72-00318

10. SCIENTIFIC AND TECHNICAL INFORMATION

NOTES ON SEDIMENTATION ACTIVITIES, CALENDER YEAR 1970.
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 02J.
W72-00318

OCEAN OUTFALL DESIGN: PART I - LITERATURE REVIEW AND THEORETICAL DEVELOPMENT,
Pacific Northwest Water Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 05B.
W72-00356

A LIST OF SCIENTIFIC AND SEMI-POPULAR PERIODICALS ON INLAND FISHERIES AND AQUACULTURE.

FAO (Food Agr Organ U N) Fish Circ. 311. 1970. 1-4. Copyright 1971, Biological Abstracts, Inc.
Identifiers: Aquaculture, Fisheries, Inland, List, Periodicals, Popular, Scientific.
W72-00531

SUBJECT INDEX

2-6-DICHLOBENIL

Influence of Several Species of Aquatic Plants on Dichlobenil Residues in Water,
W72-00137 5C

ACID MINE WATER

The Effects of Various Atmospheres on the Oxidation of Coal Mine Pyrites,
W72-00081 5G

Acidity Control in Bald Eagle Creek and West Branch Susquehanna River, Clinton County, Pennsylvania.
W72-00128 5B

Costs and Effects of a Water Quality Program for a Small Strip Mining Company,
W72-00388 5G

ACIDIC WATER

Globe Aircraft Co. v. Thompson (Damages for Acid Poisoning of Cattle).
W72-00418 6E

ACIDS

Horizontal HCl Pickling Line at Fukuyama,
W72-00004 5D

ACOUSTICS

Study of Natural Stress Distribution in Rock Massifs with the Help of Seismic-acoustic methods,
W72-00079 8E

ACRIFLAVIN

Toxicity of Certain Chemicals to Juvenile Pompano,
W72-00143 5C

ACRYLIC LACQUER

A Method of Tracing Sediment Movement on the Texas Gulf Coast,
W72-00314 2J

ACTIVATED CARBON

Adsorption of Sulfur Containing Taste and Odor Compounds on Activated Carbon,
W72-00423 5D

ACTIVATED SLUDGE

Development of Immobilized Enzyme Systems for Enhancement of Biological Waste Treatment Processes,
W72-00002 5D

Phosphate Removal by Activated Sludge,
W72-00008 5D

Sludge Activity Parameters and Their Application to Toxicity Measurements and Activated Sludge,
W72-00020 5D

The Use of Ultrafiltration Membranes for Activated Sludge Separation,
W72-00034 5D

The Effect of Surface Active Agents on Substrate Utilization in an Experimental Activated Sludge System,
W72-00035 5D

Hydraulic and Process Aspects of Reactor Design, II-Response to Variations,
W72-00439 5D

Composition Studies of Activated Sludge,
W72-00443 5D

ADJUDICATION PROCEDURE

United States V Northwest Paper Co. (Standing to Bring Qui Tam Action under Refuse Act of 1899).
W72-00121 6E

Enquist V Quaker Oats Co. (Standing to Bring Qui Tam Action Under Refuse Act of 1899, and to Seek Injunction).
W72-00140 6E

Jackson V. Clark (Necessity of Causal Relationship Between Pollution Damage and the Conduct of a Defendant).
W72-00159 6E

Environmental Protection Act.
W72-00204 6E

Suing the Polluter: Approaches to Achieve Standing,
W72-00256 5G

Farmers Chemical Ass'n v. Union Camp Co. (Denial of Jury Trial When Injunction Sought to Abate Pollution).
W72-00343 6E

Economic and Technical Problems in Environmental Litigation.
W72-00470 6E

The Functions and Features of Private Litigation in the Growth of Environmental Law,
W72-00471 6E

Environmental Lawyer in the Lion's Mouth: Litigation Before and Against Administrative Agencies,
W72-00473 6E

Defenses and the Role of Industry Lawyers,
W72-00474 6E

Tennessee Water Quality Control Act of 1971 with Commentary,
W72-00476 6E

ADMINISTRATION

The Water Pollution Control Agency: Legas Basis, Administration Regulations And Staffing,
W72-00221 5G

Technical, Financial, and Administrative Aspects of Water Supply in the Urban Environment in the Americas,
W72-00406 6B

Colorado (Analysis and Comparison with Tennessee Water Pollution Law),
W72-00482 6E

New Hampshire (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00499 6E

New Mexico (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00501 6E

North Dakota (Analysis of State's Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00503 6E

Utah (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00511 6E

Vermont (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00512 6E

Supplement to Federal Program Sections,
W72-00519 6E

ADMINISTRATIVE AGENCIES

Hall-Jones Oil Co. v Corporation Commission (Denial of Permit to Dispose of Saline Water).
W72-00006 6E

Pollution of Waters of State.
W72-00095 6E

How your Michigan Water Resources Commission Protects Michigan's Lakes and Streams.
W72-00200 6E

Air and Water Pollution Control--Permits.
W72-00202 6E

Jurisdiction of the Trustees of the Internal Improvement Trust Fund,
W72-00250 6E

Water Pollution Control Act.
W72-00262 6E

Water Pollution Control.
W72-00267 6E

Multi-Media Confrontation--The Environmentalist's Strategy for a 'No-Win' Agency Proceeding,
W72-00286 5G

National Oil and Hazardous Substances Pollution Contingency Plan.
W72-00301 6E

Clean Ocean Act.
W72-00302 6E

North Carolina Pollution Abatement and Industrial Facilities Financing Act.
W72-00304 6E

Water Dist. No. 105, King County V State (Approval and Certification for Sewer System Construction).
W72-00333 6E

Interstate Water Pollution Control.
W72-00397 6E

Annual Progress Report 1969-1970.
W72-00451 5G

Water Pollution Control Programs.
W72-00457 5G

Environmental Lawyer in the Lion's Mouth: Litigation Before and Against Administrative Agencies,
W72-00473 6E

Defenses and the Role of Industry Lawyers,
W72-00474 6E

The 1971 Water Pollution Study for the State of Tennessee,
W72-00475 6E

Alabama (Analysis and Comparison with Tennessee Water Pollution Control Law),
W72-00477 6E

Alaska (Analysis and Comparison with Tennessee Water Law),
W72-00478 6E

California (Analysis and Comparison with Tennessee Water Pollution Law),

ADMINISTRATIVE AGENCIES

W72-00481 6E

Kansas (Analysis and Comparison of Kansas and Tennessee Water Pollution Law), W72-00487 6E

Louisiana (Analysis of State's Water Pollution Law and Comparison with Present and Proposed Tennessee Law), W72-00489 6E

Maine (Analysis of State's Water Pollution Law and Comparison with Present and Proposed Tennessee Law), W72-00490 6E

Massachusetts (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law), W72-00492 6E

Michigan (Analysis of Water Pollution Law and Comparison with Present and Proposed Tennessee Law), W72-00493 6E

Minnesota (Analysis of State's Water Pollution Law and Comparison with Present and Proposed Tennessee Law), W72-00494 6E

Nebraska (Analysis of State's Water Pollution Law and Comparison with Present and Proposed Tennessee Law), W72-00497 6E

Nevada (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law), W72-00498 6E

Ohio (Analysis of State's Water Pollution Law and Comparison with Present and Proposed Tennessee Law), W72-00504 6E

Oklahoma (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law), W72-00505 6E

Virginia (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law), W72-00513 6E

Washington (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law), W72-00514 6E

West Virginia (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law), W72-00515 6E

Wisconsin (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law), W72-00516 6E

Wyoming (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law), W72-00517 6E

ADMINISTRATIVE DECISIONS

Rules and Regulations--Water Quality Standards. W72-00194 5G

Power for Tomorrow: The Siting Dilemma, W72-00269 5G

Multi-Media Confrontation--The Environmentalist's Strategy for a 'No-Win' Agency Proceeding, W72-00286 5G

Water Dist. No. 105, King County V State (Approval and Certification for Sewer System Construction). W72-00333 6E

ADMINISTRATIVE PROCEDURE

Pollution of Waters of State. W72-00095 6E

ADSORPTION

Treatment of Refinery Wastes by Physico Chemical Processes, W72-00005 5D

The Graver C.I. Process Continuous Countercurrent Filtration and Adsorption, W72-00040 5D

Adsorption of Sulfur Containing Taste and Odor Compounds on Activated Carbon, W72-00423 5D

Treatment of Wastewaters by Pulsed Adsorption Beds, W72-00425 5D

AERATION

The Case for Deep Aeration Tanks, W72-00015 5D

AFRICA

Chemistry of Natural waters - III Carbonic Acid, W72-00127 5A

AIR POLLUTION

Possible Effects of Human Activity on World Climate, W72-00171 5C

The Metabolism of Cities, W72-00403 6B

AIR POLLUTION EFFECTS

Possible Effects of Human Activity on World Climate, W72-00171 5C

ALABAMA

Movement-Behavior in Three Species of Colonial-Nesting Wading Birds: A Radio-Telemetric Study, W72-00051 7B

Alabama (Analysis and Comparison with Tennessee Water Pollution Control Law), W72-00477 6E

ALASKA

Spring Breakup of the Delta River, Alaska, W72-00094 2C

Index of Surface-Water Records to September 30, 1970--Part 15. Alaska. W72-00099 7C

Residues in Fish, Wildlife, and Estuaries, W72-00122 5B

Interference With Streams and Waters; Protection of Fish and Game. W72-00261 6E

Alaska (Analysis and Comparison with Tennessee Water Law), W72-00478 6E

ALBEDO

Albedo and Degree of Puddling of a Melting Cover of Sea Ice, W72-00331 2C

ALGAE

Effects of Zooplankton on Algae in Westhampton Lake, W72-00150 5C

Environmental Control of Growth and Differentiation in Multicellular Photosynthetics, W72-00377 5B

Disinfection of Algal Laden Waters, W72-00411 5D

ALGAL POPULATIONS

Dynamics of the Nitrogen Cycle in Lakes, W72-00354 5C

ALGORITHMS

A Methodology For Determining Optimum Longitudinal Spacing of Effluent Discharges Into A River, W72-00047 5B

Multi-time Period, Facilities Location Problems: A Heuristic Algorithm With Applications To Wastewater Treatment Systems, W72-00048 5D

ALKALINITY

Chemistry of Natural waters - III Carbonic Acid, W72-00127 5A

ALKYLBENZENE SULPHONATES

The Effect of Surface Active Agents on Substrate Utilization in an Experimental Activated Sludge System, W72-00035 5D

ALLUVIAL CHANNELS

Experimental Study Of Channel Patterns, W72-00119 2E

ALLUVIUM

Climatic Geomorphology, W72-00113 2E

Geomorphic Implications of Climatic Changes, W72-00114 2E

ALSEA RIVER BASIN (OREG)

Streamflow, Sediment-Transport, And Water-Temperature Characteristics Of Three Small Watersheds In The Alsea River Basin, Oregon, W72-00115 2E

ALUM

Treatment of Refinery Wastes by Physico Chemical Processes, W72-00005 5D

A Study Of Color Removal From Textile Dye Wastes By Chemical Coagulation, W72-00049 5D

AMORTIZATION

Tax Deductions for Pollution Control Facilities. W72-00271 6E

AMPHIPODS

Effects of Copper on Gammarus Pseudolimnaeus, Physa Integra, and Campeloma Decisum in Soft Water, W72-00148 5C

ANABAENA VARIABILIS

Toxicity of Selenium to the Blue-Green Algae, Anacystis Nidulans and Anabaena Variabilis,

W72-00153 5C

ANACYSTIS NIDULANS
Toxicity of Selenium to the Blue-Green Algae, Anacystis Nidulans and Anabaena Variabilis,
W72-00153 5C

ANAEROBIC CONDITIONS
Preliminary Investigation of the Low Dissolved Oxygen Concentrations that Exist in Long Lake Located Near Spokane, Washington,
W72-00156 5C

ANAEROBIC DIGESTION
Anaerobic Digestion of Sludges Containing Iron Phosphates,
W72-00414 5D

ANALYSIS
The Use of Biological Analyses as Indicators of Water Quality,
W72-00154 5A

Preliminary Investigation of the Low Dissolved Oxygen Concentrations that Exist in Long Lake Located Near Spokane, Washington,
W72-00156 5C

Nitrogen Cycle and Primary Production in Mesotrophic Lake Lucerne (Horwer Bay) and in Eutrophic Red Lake with Special Regard to Nitrates as Limiting Factors (Stickstoff-Kreislauf und Primaproduktion im Mesotrophen Vier-Waldstattrsee (Horwer Bucht) und im Eutrophen Rotsee, mit Besonderer Berucksichtigung des Nitrats als Limitierenden Faktors),
W72-00158 5C

Applications of Program Budgeting to Environmental Problems,
W72-00391 6B

The Valuation of Public Goods,
W72-00392 6B

ANALYTICAL TECHNIQUES
Methods for Chemical Analysis of Waters and Wastewaters,
W72-00086 2K

The Use of Radioactive Carbon Method in Studies of Trophic Relationships of Plankton (Primenenie radiouglerodnogo metoda dlya isucheniya troficheskikh vzaimootnoshenii v planktone),
W72-00161 5C

The Hydraulic Performance of Chlorine Contact Tanks,
W72-00448 5D

ANIMAL BEHAVIOR
Movement-Behavior in Three Species of Colonial-Nesting Wading Birds: A Radio-Telemetric Study,
W72-00051 7B

ANIMAL GROUPINGS
A Comparative Assessment of Pollution's Effect on the Benthic Macroinvertebrates of the Millers River, Massachusetts Using Factor Analysis, Diversity, Indices and Cluster Analysis of Similarity Coefficients,
W72-00136 5C

ANIMAL PARASITES
General Studies on Trematodes in Thailand: Classification of Cerceriae in Thailand,
W72-00138 5C

ANION ABSORPTION
Water Structure as a Determinant of Ion Distribution in Living Tissue,
W72-00207 1B

AQUATIC ENVIRONMENT
Ecological Determinants In Pollution Control Systems,
W72-00232 5G

AQUATIC HABITATS
* The Fishery Potential of Four Aquatic Environments Created by Interstate Route 91 Construction in Massachusetts,
W72-00135 4C

AQUATIC WEED CONTROL
Some Ecological Effects on the Use of Paraquat for the Control of Weeds in Small Lakes,
W72-00155 4A

Experimental Criteria for Studying Grass Carp Feeding in Relation to Weed Control,
W72-00163 4A

AQUEOUS SOLUTIONS
Light Scattering and Ultrasonic Investigations of Relaxation in Aqueous Solutions,
W72-00378 1A

AQUICULTURE
Toxicity of Certain Chemicals to Juvenile Pompano,
W72-00143 5C

ARCTIC OCEAN
Oil Pollution Control in the Canadian Arctic,
W72-00254 5G

ARID LANDS
Range Ecology at the Institute,
W72-00166 3F

Public Perception of Environmental Quality in Tucson, Arizona,
W72-00174 5G

Water Supply for the Future in Southern Nevada.
W72-00181 6D

Vegetation Studies in the Simpson Desert, N.T.,
W72-00182 2I

Some Aspects of Water Balance in Tenebrionid Beetles and a Thysanuran From the Namib Desert of Southern Africa,
W72-00184 2I

ARIZONA
Suppression of Channel-Side Chaparral Cover Increases Streamflow,
W72-00054 4A

Summer Rainfall over the Santa Catalina Mountains,
W72-00168 2B

Public Perception of Environmental Quality in Tucson, Arizona,
W72-00174 5G

Arizona (Analysis and Comparison with Tennessee Water Pollution Control Law),
W72-00479 6E

ARKANSAS
How Does Forest-Range Conversion in Ozark Uplands Affect Runoff,
W72-00164 4A

Stream Preservation in Arkansas.
W72-00190 2E

Regulation Establishing Water Quality Criteria For Interstate And Intrastate Streams.
W72-00225 5G

Annual Progress Report 1969-1970.
W72-00451 5G

Arkansas (Analysis and Comparison with Tennessee Water Pollution Law),
W72-00480 6E

ASSESSMENTS
Annual User Surveillance Fee,
W72-00520 6E

ASSOCIATIONAL ANALYSES
Vegetation Studies in the Simpson Desert, N.T.,
W72-00182 2I

ATLANTIC COASTAL PLAIN
Stability of Coastal Plain Surfaces,
W72-00091 2J

Regulations Concerning Treatment of Wastewaters, Domestic and Industrial Separately or in Combination, Discharged into the Waters of the Atlantic Coastal Plain, Including the Atlantic Ocean.
W72-00208 5D

ATLANTIC OCEAN
Atlantic Ocean Pollution and Biota Observed by the 'RA' Expeditions,
W72-00147 5C

Clean Ocean Act.
W72-00302 6E

ATLANTIC TOMCOD
Biological Investigation of Atlantic Tomcod, Microgadus Tomcod (Walbaum), in the Weweantic River Estuary, Massachusetts, 1967,
W72-00139 5C

ATMOSPHERE
Possible Effects of Human Activity on World Climate,
W72-00171 5C

Development of a Stability Correction for Estimating Convective Transfer,
W72-00316 2B

ATMOSPHERIC POLLUTION
Global Environmental Monitoring,
W72-00162 5C

Possible Effects of Human Activity on World Climate,
W72-00171 5C

ATTITUDES
Public Perception of Environmental Quality in Tucson, Arizona,
W72-00174 5G

AURFACE-GROUNDWATER RELATIONSHIPS
Analysis of the Interaction of River and Subsurface Waters (Nekotoryye elementy analiza vzaimodeystviya rechnykh i podzemnykh vod),
W72-00320 2F

AUSTRALIA
Vegetation Studies in the Simpson Desert, N.T.,
W72-00182 2I

AUTOMATIC CONTROL
New Applications of On-stream Analysers in Pulp Mills,

AUTOMATIC CONTROL

W72-00009 5A

Process Control of Centrifuge Operations,
W72-00017 5D

Direct Digtal Control at Grand Rapids, Michigan,
W72-00043 5D

An Automatic Runoff Sampler,
W72-00118 7B

Feasibility of Computer Control of Wastewater Treatment.
W72-00408 5D

AUTOMATIC SAMPLER (OVERLAND FLOW)
An Automatic Runoff Sampler,
W72-00118 7B

AVERAGE COSTS
Multistage Marginal Cost Model of Investment-Pricing Decisions: Application to Urban Water Supply Treatment Facilities,
W72-00386 6C

BACKMIXING
Problems in Obtaining Adequate Sewage Disinfection,
W72-00419 5D

BAKERY WASTES
DESIGN OF A TREATMENT PLANT FOR BAKERY WASTES,
W72-00021 5D

BALANCE OF NATURE
Subtle Aspects of Ecosystem Management,
W72-00430 6G

BALD EAGLE CREEK (PENN)
Acidity Control in Bald Eagle Creek and West Branch Susquehanna River, Clinton County, Pennsylvania.
W72-00128 5B

BAUXITE
Gibbsite in Coastal Plain Soils, Southeastern United States,
W72-00090 2G

BAY OF FUNDY
Sedimentological Sampling and Results from the Diver Lock-out Facility of the Submersible Shelf Diver, Bay of Fundy, Nova Scotia,
W72-00131 2L

BAYS
Sedimentological Sampling and Results from the Diver Lock-out Facility of the Submersible Shelf Diver, Bay of Fundy, Nova Scotia,
W72-00131 2L

BEACH EROSION
Beach Processes and Shoreline Changes, Kouchibouguac Bay, New Brunswick,
W72-00133 2L

BEACHES
Public Bathing Beaches.
W72-00278 6E

BED LOAD
Study of the Geometry of Sand Dunes and Estimation of Bottom Sediment Discharge (Issledovaniye geometricheskikh kharakteristik peschanykh gryad i otsenka raskhoda donnykh nanosov),
W72-00069 2J

BEDS
Jurisdiction of the Trustees of the Internal Improvement Trust Fund,
W72-00250 6E

BEHAVIORAL ASPECTS
Public Perception of Environmental Quality in Tucson, Arizona,
W72-00174 5G

BENEFITS
Environmental Policy and Management,
W72-00390 6B

The Valuation of Public Goods,
W72-00392 6B

Effects of Reservoir Operating Policy on Recreation Benefits,
W72-00399 4A

BIBLIOGRAPHIES
Notes on Sedimentation Activities, Calender Year 1970.
W72-00318 2J

BIO-REGENERATION
Bio-regenerated Activated Carbon Treatment of Textile Dye Wastewaters,
W72-00003 5D

BIOASSAY
Toxicity of Certain Chemicals to Juvenile Pompano,
W72-00143 5C

BIOCHEMICAL OXYGEN DEMAND
Sludge Activity Parameters and Their Application to Toxicity Measurements and Activated Sludge,
W72-00020 5D

DESIGN OF A TREATMENT PLANT FOR BAKERY WASTES,
W72-00021 5D

A Critical Review of BOD Analysis Using Respirometer Techniques,
W72-00036 5A

Regulations Concerning Treatment of Wastewaters, Domestic and Industrial, Separately or in Combination, Discharged into the Waters of the Hackensack River.
W72-00206 5D

Regulations Concerning Treatment of Wastewaters, Domestic and Industrial, Separately or in Combination, Discharged into the Waters of the Passaic River Including the Newark Bay.
W72-00210 5D

Regulations Concerning Treatment of Wastewaters, Domestic and Industrial, Separately or in Combination, Discharged into the Waters of the Raritan River Basin Including the Raritan Bay.
W72-00211 5D

Regulations Concerning Treatment of Wastewaters, Domestic and Industrial, Separately or in Combination, Discharged into the Waters of the Delaware River Basin.
W72-00212 5D

Implications of Nitrogenous BOD in Treatment Plant Design,
W72-00420 5D

BOD From Poultry Processing Plants,
W72-00444 5D

BIODEGRADATION
Hydrolysis of Lipids in Wastewater,
W72-00421 5D

Treatment of Wastewaters by Pulsed Adsorption Beds,
W72-00425 5D

BIOLOGICAL--GAMMA-RADIATION SYSTEM
Biological--Gamma-Radiation System for Sewage Processing,
W72-00383 5D

BIOLOGICAL TREATMENT
Development of Immobilized Enzyme Systems for Enhancement of Biological Waste Treatment Processes,
W72-00002 5D

BIPOLAR TRANSMISSION LINES
Nelson River HVDC Transmission Line Towers,
W72-00339 8C

BIRDS
Movement-Behavior in Three Species of Colonial-Nesting Wading Birds: A Radio-Telemetric Study,
W72-00051 7B

BOATING REGULATIONS
Sewage Disposal.
W72-00265 6E

Boating Litter and Pollution Control.
W72-00438 6E

BODIES OF WATER
Procedures for Computing Evaporation from 20-Square-Meter Evaporation Pans Based on Observations in GGI-3,000 Evaporimeters (Metodika rascheta ispareniya s basseynov ploshchad'yu 20 m2 po nablyudeniyam v isparitelyakh GGI-3,000),
W72-00062 2D

BOTTOM SEDIMENTS
Study of the Geometry of Sand Dunes and Estimation of Bottom Sediment Discharge (Issledovaniye geometricheskikh kharakteristik peschanykh gryad i otsenka raskhoda donnykh nanosov),
W72-00069 2J

Organic Carbon in Sediments of the North Carolina Continental Rise,
W72-00092 2J

Sand Waves on Browns Bank Observed from the Shelf Diver,
W72-00130 2J

Sedimentological Sampling and Results from the Diver Lock-out Facility of the Submersible Shelf Diver, Bay of Fundy, Nova Scotia,
W72-00131 2L

Exotic Pebbles in Quaternary Deposits from the South Coast of the St. Lawrence Estuary, Quebec,
W72-00134 2L

BOUNDARIES (PROPERTY)
Jurisdiction of the Department of Air and Water Pollution Control,
W72-00249 6E

BRAIDING
Spring Breakup of the Delta River, Alaska,
W72-00094 2C

BREAKWATERS
Expansion of Santa Barbara Harbor, California. Hydraulic Model Investigation,

W72-00349 6B

Expansion and Revision of Kawaihae Harbor, Hawaii: Hydraulic Model Investigation,
W72-00364 8B

Design for Expansion of Port San Luis, California; Hydraulic Model Investigation,
W72-00366 8B

Wave Action in Mission Bay Harbor, California: Hydraulic Model Investigation,
W72-00367 8B

Wave Action and Breakwater Location, Noyo Harbor, California: Hydraulic Model Investigation,
W72-00370 8B

BRINE DISPOSAL
Hall-Jones Oil Co. v Corporation Commission (Denial of Permit to Dispose of Saline Water).
W72-00006 6E

Study of Unconventional Methods for Brine Concentration,
W72-00379 3A

BRINES
Effect of Precipitation and Evaporation on Changes in Solution Concentration (Vliyaniye dozhdey i ispareniya na izmeneniye kontsentratsii rastvorov),
W72-00064 5B

BUDGETING
Applications of Program Budgeting to Environmental Problems,
W72-00391 6B

The Money Gap - Can States Fill It,
W72-00396 6C

BY-PRODUCT RECOVERY
Analysis of Food Processing Wastewaters,
W72-00011 5D

BYPRODUCTS
A New Process For Recovery of By-products From Shellfish Waste,
W72-00025 5D

CALIBRATIONS
Precise Sediment Density Determination by Gamma-Ray Attenuation Alone,
W72-00059 2J

CALIFORNIA
The Quaternary Deltaic and Channel System in the Central Great Valley, California,
W72-00177 2J

Licensing and Regulation of use of Oil Spill Cleanup Agents.
W72-00264 6E

Private Action Under the Public Trust: An Environmental Bill of Rights for California,
W72-00272 5G

People V. City of Los Angeles (Municipal Sewage Disposal Regulation by the State Department of Health).
W72-00398 6E

San Francisco Bay-Delta Water Quality Control Program: Final Report.
W72-00454 5G

California (Analysis and Comparison with Tennessee Water Pollution Law),
W72-00481 6E

CALVING (GLACIERS)
Flexure of a Floating Ice Tongue,
W72-00330 2C

CANADA
Methods for Chemical Analysis of Waters and Wastewaters,
W72-00086 2K

Sand Waves on Browns Bank Observed from the Shelf Diver,
W72-00130 2J

CANNERIES
Reduction of Salt Content of Food Processing Liquid Waste Effluent,
W72-00409 5D

CARBON DIOXIDE
Chemistry of Natural waters - III Carbonic Acid,
W72-00127 5A

The Relative Role of Stomata in Transpiration and Assimilation,
W72-00175 2D

CARBONIC ACID
Chemistry of Natural waters - III Carbonic Acid,
W72-00127 5A

CARP
The Influence of Oxygen Concentration on Routine Metabolism of Cyprinus Carpio L. in Different Temperature Conditions, (Influenta Concentratiei de Oxigen Asupra Metabolismului Energetic la Cyprinus Carpio L. in Diferite Conditii de Temperatura),
W72-00144 5C

Experimental Criteria for Studying Grass Carp Feeding in Relation to Weed Control,
W72-00163 4A

CATION ABSORPTION
Water Structure as a Determinant of Ion Distribution in Living Tissue,
W72-00207 1B

CATTAILS
Microfungi in the Water, Mud, and Litter of a Cattail Marsh,
W72-00151 5C

CATTLE
Globe Aircraft Co. v. Thompson (Damages for Acid Poisoning of Cattle).
W72-00418 6E

CATTLE EGRETS
Movement-Behavior in Three Species of Colonial-Nesting Wading Birds: A Radio-Telemetric Study,
W72-00051 7B

CENTRAL AUSTRALIA
The Geomorphology of Central Australia, (Geomorphologie von Zentralaustralien Nach H. Bremer),
W72-00170 2J

CENTRIFUGATION
Centrifuges in Water and Waste Treatment,
W72-00016 5D

Process Control of Centrifuge Operations,
W72-00017 5D

CHAIN SYSTEMS
Subtle Aspects of Ecosystem Management,
W72-00430 6G

CHANGE
Man and His Changing Environment,
W72-00405 5G

CHANNEL FLOW
Relation Of Morphometry To Runoff Frequency,
W72-00112 2E

CHANNEL IMPROVEMENT
Expansion of Santa Barbara Harbor, California. Hydraulic Model Investigation,
W72-00349 6B

Navigation Conditions in Fort Smith Reach, Arkansas River. Hydraulic Model Investigation,
W72-00360 8B

CHANNEL MORPHOLOGY
Open Channel Flow,
W72-00108 8B

Hydraulic Geometry,
W72-00109 8B

Relation Of Morphometry To Runoff Frequency,
W72-00112 2E

Experimental Study Of Channel Patterns,
W72-00119 2E

The Quaternary Deltaic and Channel System in the Central Great Valley, California,
W72-00177 2J

Turkey Creek Channel Stability Studies, Farwell Unit, Middle Loup Division, Picksloan Missouri Basin Program.
W72-00376 8D

CHANNEL MORPHOMETRY
Relation Of Morphometry To Runoff Frequency,
W72-00112 2E

CHANNEL STABILIZATION
Turkey Creek Channel Stability Studies, Farwell Unit, Middle Loup Division, Picksloan Missouri Basin Program.
W72-00376 8D

CHAPARRAL
Suppression of Channel-Side Chaparral Cover Increases Streamflow,
W72-00054 4A

CHAPARRAL STREAM-COVER CONTROL
Suppression of Channel-Side Chaparral Cover Increases Streamflow,
W72-00054 4A

CHEMCONTROL
Influence of Several Species of Aquatic Plants on Dichlobenil Residues in Water,
W72-00137 5C

Toxicity of Certain Chemicals to Juvenile Pompano,
W72-00143 5C

CHEMICAL ANALYSIS
Ecological Determinants In Pollution Control Systems,

CHEMICAL ANALYSIS

W72-00232 5G

North v. Evans (Damage to Land from Salt Water Discharged from Oil Wells).
W72-00466 6E

CHEMICAL CONDITIONING
Chemical Conditioning of Biological Sludges for Vacuum Filtration,
W72-00037 5D

CHEMICAL OXYGEN DEMAND
Sludge Activity Parameters and Their Application to Toxicity Measurements and Activated Sludge,
W72-00020 5D

CHEMICAL PRECIPITATION
Anaerobic Digestion of Sludges Containing Iron Phosphates,
W72-00414 5D

CHEMICAL REACTIONS
Development of a Chemical Denitrification Process,
W72-00001 5D

Gas Absorption in a Heterogeneous System,
W72-00085 5A

CHEMICAL TREATMENT
Development of a Chemical Denitrification Process,
W72-00001 5D

CHEMICAL WASTES
In the Matter of Mercury Standards.
W72-00279 5G

CHLORINATED HYDROCARBON PESTICIDES
Chlorinated Hydrocarbons: Emerging Implications in Regional Planning,
W72-00038 5B

CHLORINATION
Disinfection of Algal Laden Waters,
W72-00411 5D

Inactivation of Virus in Sewage,
W72-00412 5D

Problems in Obtaining Adequate Sewage Disinfection,
W72-00419 5D

Chlorination Dynamics in Wastewater Effluents,
W72-00422 5D

The Hydraulic Performance of Chlorine Contact Tanks,
W72-00448 5D

CHLORINE
The Automatic Detection of Low Levels of Dissolved Free Chlorine in Fish Farming Experiments Using Seawater Effluents,
W72-00141 5C

CHLORINE INTERMEDIATES
Inactivation of Virus in Sewage,
W72-00412 5D

CITIES
How we Got the Dirtiest Stream in America,
W72-00282 5G

Multistage Marginal Cost Model of Investment-Pricing Decisions: Application to Urban Water Supply Treatment Facilities,
W72-00386 6C

The Metabolism of Cities,
W72-00403 6B

City of Bethany v. Twin Lakes Gun Club (Measuring Damages to Plaintiff's Lake from Pollution from City Sewage Disposal Plant).
W72-00461 6E

CITIZENS
Nourishing Public Participation,
W72-00394 6B

CITY WATER SUPPLY
Multistage Marginal Cost Model of Investment-Pricing Decisions: Application to Urban Water Supply Treatment Facilities,
W72-00386 6C

CLASSIFICATION
General Studies on Trematodes in Thailand: Classification of Cerceriae in Thailand,
W72-00138 5C

What is Pollution,
W72-00462 5G

CLAY MINERALS
Gibbsite in Coastal Plain Soils, Southeastern United States,
W72-00090 2G

CLAYS
Design and Operation of a Triaxial, High-Temperature, High-Pressure Compaction Apparatus,
W72-00058 2J

CLEAN WATER RESTORATION ACT OF 1966
Clean Water for Mississippi's Estuaries.
W72-00246 5G

CLIMATES
Climatic Geomorphology,
W72-00113 2E

Geomorphic Implications of Climatic Changes,
W72-00114 2E

CLIMATIC DATA
A Global Classification of Solar Radiation,
W72-00169 2D

On the Global Solar Radiation Climate and Evapotranspiration Estimates in India,
W72-00180 2D

CLIMATIC GEOMORPHOLOGY
Climatic Geomorphology,
W72-00113 2E

Geomorphic Implications of Climatic Changes,
W72-00114 2E

CLIMATIC ZONES
Climatic Geomorphology,
W72-00113 2E

CLOUD SEEDING
Performance of an Atmospheric Water Resources Research Program in the Hungry Horse Area, Montana, 1969-70 Season.
W72-00375 3B

COAGULANTS
Coagulants for Waste Water Treatment,
W72-00014 5D

COAGULATION
Treatment of Refinery Wastes by Physico Chemical Processes,
W72-00005 5D

A Study Of Color Removal From Textile Dye Wastes By Chemical Coagulation,
W72-00049 5D

Coagulation Of Textile Dye Wastes,
W72-00050 5D

COASTAL PLAINS
Stability of Coastal Plain Surfaces,
W72-00091 2J

COASTAL RESOURCES
A Return to the Coast,
W72-00393 2L

COASTAL ZONE MANAGEMENT
A Return to the Coast,
W72-00393 2L

COASTS
A Return to the Coast,
W72-00393 2L

Some Aspects of the Hydrography of a Relatively Unpolluted Estuary in Southeastern Massachusetts,
W72-00431 5C

COBALT
Biological--Gamma-Radiation System for Sewage Processing,
W72-00383 5D

COHESIVE SOILS
Turkey Creek Channel Stability Studies, Farwell Unit, Middle Loup Division, Picksloan Missouri Basin Program.
W72-00376 8D

COLLECTING SEWERS
Sewer Construction.
W72-00291 6E

COLOR
Bio-regenerated Activated Carbon Treatment of Textile Dye Wastewaters,
W72-00003 5D

A Study Of Color Removal From Textile Dye Wastes By Chemical Coagulation,
W72-00049 5D

COLORADO
Colorado (Analysis and Comparison with Tennessee Water Pollution Law),
W72-00482 6E

COLORADO RIVER BASIN
Computer Simulation of the Hydrologic-Salinity Flow System within the Upper Colorado River Basin,
W72-00084 7C

COMBINED SEWERS
Combined Wastewater Collection And Treatment Facility, Mount Clemens, Michigan,
W72-00042 5D

Dispatching System for Control of Combined Sewer Losses,
W72-00080 5G

Combined Sewer Overflow Abatement Alternatives: Washington, D.C.,
W72-00082 5D

COMMUNICATION
Nourishing Public Participation,
W72-00394 6B

COMPACTION
Design and Operation of a Triaxial, High-Temperature, High-Pressure Compaction Apparatus,

W72-00058 2J

COMPUTER APPLICATIONS
Monte Carlo Study of Seismic Structural Safety,
W72-00072 7C

COMPUTER MODELS
Computer Simulation of the Hydrologic-Salinity Flow System within the Upper Colorado River Basin,
W72-00084 7C

CONCENTRATION GRADIENT
Treatment of Wastewaters by Pulsed Adsorption Beds,
W72-00425 5D

CONCRETE TECHNOLOGY
Optimum Sample Sizes for Concrete Cylinder Tests Using Information Theory,
W72-00076 8F

CONCRETE TESTS
Optimum Sample Sizes for Concrete Cylinder Tests Using Information Theory,
W72-00076 8F

CONDEMNATION
Acquisition of Surface Lands for Water Quality Control.
W72-00275 6E

CONFERENCE OF FEDERAL AND STATE WATER OFFICIALS
Nourishing Public Participation,
W72-00394 6B

CONFERENCES
Transcripts of the Speeches, National Conference on Environmental Law.
W72-00468 6E

CONFINED WATER
Role of Artesian Water in the Formation of Streamflow as Illustrated by the Tosna River (Otsenka roli napornykh podzemnykh vod v formirovanii rechnogo stoka na primere r. Tosny),
W72-00321 2F

CONFINEMENT PENS
Cattle Feedlots and Alternatives for Waste Management,
W72-00428 5G

CONIFEROUS FORESTS
Forest Litter as an Accumulator of Moisture (Lesnaya podstilka--akkumulyator vlagi),
W72-00067 2G

CONNECTICUT
Tax Treatment of Pollution Control Facilities.
W72-00243 5D

An Act to Ban High Phosphate Detergents.
W72-00244 6E

An Act Concerning the Insurance or Bonding of Oil Companies and Carriers.
W72-00245 6E

Terminals for the Loading or Discharge of Petroleum or Chemical Liquids or Products from Vessels.
W72-00299 5G

CONSERVATION
Stream Preservation in Arkansas.
W72-00190 2E

Pollution Control Agency.
W72-00263 6E

CONSTITUENT FLUORESCENCE
A Procedure for Tracing of Kraft Mill Effluent from an Ocean Outfall by Constituent Fluorescence,
W72-00123 5B

CONSTITUTIONALITY
Maine's Oil Spill Legislation: Can a State with an Extensive Interest in its Coastal Resources Protect Itself from Inadequacies in National and International Law,
W72-00283 5G

CONSTRUCTION COSTS
Water Pollution Abatement Grants to Subdivision of the State.
W72-00268 6E

Sewer Construction.
W72-00291 6E

CONTACT TANK PERFORMANCE
The Hydraulic Performance of Chlorine Contact Tanks,
W72-00448 5D

CONTACT TIME
Disinfection of Algal Laden Waters,
W72-00411 5D

CONTAINER FACILITIES
The Great Lakes Container Dilemma,
W72-00385 6C

CONTAINERS
The Great Lakes Container Dilemma,
W72-00385 6C

CONTINENTAL RISE
Organic Carbon in Sediments of the North Carolina Continental Rise,
W72-00092 2J

CONTINENTAL SHELF
Sand Waves on Browns Bank Observed from the Shelf Diver,
W72-00130 2J

CONTINENTAL SLOPE
Organic Carbon in Sediments of the North Carolina Continental Rise,
W72-00092 2J

CONTRACTS
Contract Regarding an Interim Supplement to Tanker Liability for Oil Pollution.
W72-00191 5G

CONTROL
Hvdc transmission Control Schemes.
W72-00342 8C

Values in the Control of Environment,
W72-00404 5G

CONVECTION
Development of a Stability Correction for Estimating Convective Transfer,
W72-00316 2B

CONVECTIVE TRANSFER
Development of a Stability Correction for Estimating Convective Transfer,
W72-00316 2B

CONVERSION
Hvdc transmission Control Schemes.
W72-00342 8C

CONVERTERS (ELECTRICAL)
Development of an HVDC Solid State Back to Back Asynchronous Tie,
W72-00338 8C

COOLING
The Effect of Air Temperature and Moisture Stress Upon Leaf Surface Temperatures of Calotropis Procera (Willd.) R. Br.,
W72-00183 2I

COOLING TOWERS
Cooling Towers,
W72-00337 8D

COOLING WATER
Cooling Towers,
W72-00337 8D

COPAN LAKE
Oklahoma Copan Lake. Little Caney River, Flood Control, Water Qaulity, Water Supply, Fish and Wildlife and Recreation Lake Located in Washington, County.
W72-00348 6G

COPELAND PROCESS
The Copeland Process Fluid Bed System and Pollution Control World Wide,
W72-00447 5D

COPPER
The Chemical States of Copper in Polluted Fresh Water and a Scheme of Analysis to Differentiate Them,
W72-00126 5B

Effects of Copper on Gammarus Pseudolimnaeus, Physa Integra, and Campeloma Decisum in Soft Water,
W72-00148 5C

COPPER SULFATE
Toxicity of Certain Chemicals to Juvenile Pompano,
W72-00143 5C

CORE CHEMISTRY
Infiltration Rates and Groundwater Quality Beneath Cattle Feedlots, Texas High Plains,
W72-00083 5B

CORRELATION ANALYSIS
Evaluation of Dispersed Pollutional Loads from Urban Areas,
W72-00355 5B

COST ALLOCATION
The Money Gap - Can States Fill It,
W72-00396 6C

COST ANALYSIS
Projected Wastewater Treatment Costs in the Organic Chemicals Industry,
W72-00028 5D

Direct Digtal Control at Grand Rapids, Michigan,
W72-00043 5D

A Methodology For Determining Optimum Longitudinal Spacing of Effluent Discharges Into A River,
W72-00047 5B

Multi-time Period, Facilities Location Problems: A Heuristic Algorithm With Applications To Wastewater Treatment Systems,

W72-00048 5D

COST-BENEFIT ANALYSIS
Applications of Program Budgeting to Environmental Problems,
W72-00391 6B

The Valuation of Public Goods,
W72-00392 6B

COST-EFFECTIVE ANALYSIS
Applications of Program Budgeting to Environmental Problems,
W72-00391 6B

COST REPAYMENT
Water Pollution Abatement Grants to Subdivision of the State.
W72-00268 6E

COST SHARING
The Money Gap - Can States Fill It,
W72-00396 6C

COST TRANSFER
Annual User Surveillance Fee,
W72-00520 6E

COSTS
Environmental Policy and Management,
W72-00390 6B

The Valuation of Public Goods,
W72-00392 6B

The Money Gap - Can States Fill It,
W72-00396 6C

CREEP
The Mechanical Properties of Single Crystals of Pure Ice,
W72-00336 2C

CROP RESPONSE
Varied Responses to India's Agricultural Strategy,
W72-00173 3F

CROPS
Some Aspects of Resource Use in Relation to the Orange River Project,
W72-00185 3F

CRYOLOGY
The Mechanical Properties of Single Crystals of Pure Ice,
W72-00336 2C

CRYSTAL GROWTH
On the Rates of Growth of Grains and Crystals in South Polar Firn,
W72-00329 2C

CURRENT METERS
Some Simple Devices for the Study of Wave Induced Surges,
W72-00056 2E

CYANIDE
Precipitate Flotation of Complexed Cyanide,
W72-00029 5D

CYANOPHYTA
Toxicity of Selenium to the Blue-Green Algae, Anacystis Nidulans and Anabaena Variabilis,
W72-00153 5C

Dynamics of the Nitrogen Cycle in Lakes,
W72-00354 5C

CYLINDERS
Design of a Circular Hydraulic Jump,
W72-00074 8B

CYSTS
Chlorination Dynamics in Wastewater Effluents,
W72-00422 5D

CYTOLOGICAL STUDIES
Water Structure as a Determinant of Ion Distribution in Living Tissue,
W72-00207 1B

DAMAGES
Possible Liabilities Arising from Violations of Conservation Orders,
W72-00220 6E

Liability In National And International Law For Damage Through Water Pollution,
W72-00224 5G

Inter-Governmental Maritime Consultative Organization: Draft Convention On Civil Liability For Pollution Damage.
W72-00228 6E

Tort Liability and the Oil and Gas Industry,
W72-00257 5G

The Challenge of Environmental Quality: An Outline of Remedies to Meet It,
W72-00270 5G

Thompson V. Walsh (Injury to Cattle Resulting From Stream Pollution by Oil Lessee).
W72-00400 6E

Mid-Continent Pipeline Co v Crauthers (Release of Servant Tortfeasor).
W72-00413 6E

Peterson V. Texas Co. (Liability for Damages Caused by Escape Wastes from Oil Lease),
W72-00458 6E

Town of Braggs V. Slape (Liability for Damages Caused by Municipal Discharge of Raw Sewage).
W72-00460 6E

City of Bethany v. Twin Lakes Gun Club (Measuring Damages to Plaintiff's Lake from Pollution from City Sewage Disposal Plant).
W72-00461 6E

North v. Evans (Damage to Land from Salt Water Discharged from Oil Wells).
W72-00466 6E

Kinnischtzke V. City of Glen Ullin (Liability of Municipality Discharging Inadequately Treated Sewage).
W72-00544 6E

DAMS
Model Law to Improve Dam Safety,
W72-00073 6E

Dams And Ecology--Can They Be Made Compatible,
W72-00116 8A

Effect of Valve Position in a Sidewall Port Filling System, Newburgh Lock, Ohio River: Hydraulic Model Investigation,
W72-00346 8B

Webers Falls Lock and Dam, Arkansas River Navigation Project: Hydraulic Model Investigation,
W72-00347 8B

Jones Bluff Lock and Dam, Alabama River Navigation Project: Hydraulic Model Investigation,
W72-00359 8B

Navigation Conditions in Fort Smith Reach, Arkansas River. Hydraulic Model Investigation,
W72-00360 8B

Mechanics of Flow from Stratified Reservoirs in the Interest of Water Quality: Hydraulic Laboratory Investigation,
W72-00361 5F

Navigation Conditions at Lock and Dam No. 3, Arkansas River, Arkansas and Oklahoma, Hydraulic Model Investigation,
W72-00362 8B

Navigation Conditions at Lock and Dam No. 7, Arkansas River: Hydraulic Model Investigation,
W72-00365 8B

Outlet Works for Beltzville Dam, Pohopoco Creek, Pennsylvania: Hydraulic Model Investigation,
W72-00369 8B

Outlet Works for New Hope Reservoir Cape Fear River Basin, North Carolina: Hydraulic Model Investigation,
W72-00371 8B

Spillway for Kaysinger Bluff Dam Osage River, Missouri, Hydraulic Model Investigation,
W72-00372 8B

Navigation Conditions at Hannibal Locks and Dam, Ohio and West Virginia: Hydraulic Model Investigation,
W72-00373 8B

DATA COLLECTION SYSTEMS
An Automated Test Facility for Rock Mechanics Research,
W72-00344 8E

DATA COLLECTIONS
Annual Compilation and Analysis of Hydrologic Data for Elm Fork Trinity River, Trinity River Basin, Texas, 1969,
W72-00097 7C

Measurement of Interflow and Deep Seepage on Piedmont Watersheds,
W72-00311 2G

DECIDUOUS FORESTS
Forest Litter as an Accumulator of Moisture (Lesnaya podstilka--akkumulyator vlagi),
W72-00067 2G

DECISION MAKING
Environmental Policy and Management,
W72-00390 6B

Nourishing Public Participation,
W72-00394 6B

The Evolution of a Funding Policy,
W72-00395 6B

Water-Economics and Politics,
W72-00407 6B

DEER
Management Model for Terrestrial Wildlife Based on Energy Relationships,

W72-00052 6G

DEFLECTION
Elexure of a Floating Ice Tongue,
W72-00330 2C

DELAWARE RIVER
Regulations Concerning Treatment of Wastewaters, Domestic and Industrial, Separately or in Combination, Discharged into the Waters of the Delaware River Basin.
W72-00212 5D

DELTA RIVER (ALASKA)
Spring Breakup of the Delta River, Alaska,
W72-00094 2C

DELTAS
The Quaternary Deltaic and Channel System in the Central Great Valley, California,
W72-00177 2J

DEMITRIFICATION
Dynamics of the Nitrogen Cycle in Lakes,
W72-00354 5C

DENITRIFICATION
Development of a Chemical Denitrification Process,
W72-00001 5D

DENSITY
Precise Sediment Density Determination by Gamma-Ray Attenuation Alone,
W72-00059 2J

DES PLAINES RIVER
Water Quality Standards (Interstate Waters, Illinois River and Lower Section of Des Plaines River),
W72-00195 6E

DESALINATION
Reduction of Salt Content of Food Processing Liquid Waste Effluent,
W72-00409 5D

DESALINATION PLANTS
Study of Unconventional Methods for Brine Concentration,
W72-00379 3A

DESIGN
Pigskin Tannery Waste,
W72-00024 5D

Clarification of the Lime Bearing Wastes from a Sole Leather Tannery,
W72-00434 5D

DESIGN CRITERIA
BOD From Poultry Processing Plants,
W72-00444 5D

Discussion of 'BOD From Poultry Processing Plants',
W72-00445 5D

DESIGN DATA
Kinetic Aanalysis of Data from Biological Systems,
W72-00007 5D

DETERGENTS
The Effect of Surface Active Agents on Substrate Utilization in an Experimental Activated Sludge System,
W72-00035 5D

An Act to Ban High Phosphate Detergents.
W72-00244 6E

DEWATERING
Process Control of Centrifuge Operations,
W72-00017 5D

Chemical Conditioning of Biological Sludges for Vacuum Filtration,
W72-00037 5D

DIAGENESIS
Design and Operation of a Triaxial, High-Temperature, High-Pressure Compaction Apparatus,
W72-00058 2J

DIFFERENTIAL THERMAL ANALYSIS
Method of a New Differential Thermal Analysis,
W72-00030 5A

DIFFUSERS
SUBMARINE DISPOSAL OF INDUSTRIAL WASTE,
W72-00041 5E

DIGESTER SUPERNATANT RECYCLE
Anaerobic Digestion of Sludges Containing Iron Phosphates,
W72-00414 5D

DIGESTERS
Nomograph Solution of Heat Requirements for Digesters.
W72-00417 5D

DIGITAL COMPUTERS
Direct Digtal Control at Grand Rapids, Michigan,
W72-00043 5D

Water Resource Pollutant Identification by Digital Computer Analysis of Remote Infrared Sensor Spectral Intensities,
W72-00305 5A

Feasibility of Computer Control of Wastewater Treatment.
W72-00408 5D

DIGITAL RECORDING
An Automated Test Facility for Rock Mechanics Research,
W72-00344 8E

DIRECT CURRENT
Development of an HVDC Solid State Back to Back Asynchronous Tie,
W72-00338 8C

Nelson River HVDC Transmission Line Towers,
W72-00339 8C

Hvdc transmission Control Schemes.
W72-00342 8C

DISCHARGE (WATER)
Experimental Hydrologic Investigations at Valday (Eksperimental'nyye gidrologicheskiye issledovaniya na Valdaye).
W72-00061 2B

Accuracy of Field Hydrometric Work in Studying Subsurface Flow (Tochnost' ekspeditsionnykh gidrometricheskikh rabot pri izuchenii podzemnogo stoka),
W72-00322 2F

DISCHARGES (WATER)
Water Quality Standard Certifications.
W72-00294 6E

DISINFECTION
Problems in Obtaining Adequate Sewage Disinfection,
W72-00419 5D

Chlorination Dynamics in Wastewater Effluents,
W72-00422 5D

DISPERSED SYSTEMS
Subtle Aspects of Ecosystem Management,
W72-00430 6G

DISPERSION
Evaluation of Dispersed Pollutional Loads from Urban Areas,
W72-00355 5B

DISSOLVED OXYGEN
A Field Study of Inorganic Nitrogen Oxidation Rates,
W72-00018 5B

Reaeration through Low Dams in the Ohio River,
W72-00032 5G

An Experimental Study of the Effect of Channel Surface Roughness on the Reaeration Rate Coefficient,
W72-00039 5G

Survival and Hatching of Walleye Eggs at Various Dissolved Oxygen Levels,
W72-00142 5C

Preliminary Investigation of the Low Dissolved Oxygen Concentrations that Exist in Long Lake Located Near Spokane, Washington,
W72-00156 5C

DISTILLATIONS
Development of Immobilized Enzyme Systems for Enhancement of Biological Waste Treatment Processes,
W72-00002 5D

DISTRIBUTION PATTERNS
Summer Rainfall over the Santa Catalina Mountains,
W72-00168 2B

DISULFIDE
Adsorption of Sulfur Containing Taste and Odor Compounds on Activated Carbon,
W72-00423 5D

DOCUMENTATION
Index of Surface-Water Records to September 30, 1970--Part 10. The Great Basin.
W72-00098 7C

Index of Surface-Water Records to September 30, 1970--Part 15. Alaska.
W72-00099 7C

Notes on Sedimentation Activities, Calender Year 1970.
W72-00318 2J

DOMESTIC ANIMALS
Agricultural And Related Wastes Control.
W72-00231 5G

DRAINAGE
Design Considerations for Agricultural Drains on the Columbia Basin Project,
W72-00341 8B

Estimating Soil Permeability Rates,

DRAINAGE

W72-00345 2G

DRAINAGE SYSTEMS
Design Considerations for Agricultural Drains on the Columbia Basin Project,
W72-00341 8B

DRAINAGE WATER
The Nutrient Content of Drainage Water from Agricultural Land,
W72-00157 5C

DREDGING
Permits to Dredge or Fill in or About Estuarine Waters or State Owned Lakes.
W72-00296 6E

DREGING
Tidal Waters (Excavating and Dredging Regulation).
W72-00297 6E

DRILLING
General Crude Oil Co. V. Aiken (Groundwater Pollution by Saline Water from Oil Drilling Operations as Creating Permanent Damages).
W72-00363 5G

DUNES
Study of the Geometry of Sand Dunes and Estimation of Bottom Sediment Discharge (Issledovaniye geometricheskikh kharakteristik peschanykh gryad i otsenka raskhoda donnykh nanosov),
W72-00069 2J

Vegetation Studies in the Simpson Desert, N.T.,
W72-00182 2I

DURBAN (SOUTH AFRICA)
Chemistry of Natural waters - III Carbonic Acid,
W72-00127 5A

DYE WASTES
Bio-regenerated Activated Carbon Treatment of Textile Dye Wastewaters,
W72-00003 5D

A Study Of Color Removal From Textile Dye Wastes By Chemical Coagulation,
W72-00049 5D

Coagulation Of Textile Dye Wastes,
W72-00050 5D

DYNAMIC PROGRAMMING
Analysis of Food Processing Wastewaters,
W72-00011 5D

EARTH (PLANET)
World Erosion and Sedimentation,
W72-00101 2J

EARTHQUAKES
Monte Carlo Study of Seismic Structural Safety,
W72-00072 7C

EASEMENTS
Phillips V. Altman (Covenant Not to Sue as a Defense to a Public Nuisance),
W72-00335 6E

Magnolia Petroleum Co. V. McGeeley (Payment for Void Easements as Offset to Recovery for Pollution Damages).
W72-00543 6E

ECOLOGICAL DISTRIBUTION
Vegetation Studies in the Simpson Desert, N.T.,
W72-00182 2I

ECOLOGY
Dams And Ecology--Can They Be Made Compatible,
W72-00116 8A

Flood-Plain Management Must Be Ecologically And Economically Sound,
W72-00117 2E

Environmental Control of Growth and Differentiation in Multicellular Photosynthetics,
W72-00377 5B

ECONOMIC ASPECTS
Controlling Pollution: The Economics of a Cleaner America,
W72-00459 5G

ECONOMIC EFFICIENCY
Varied Responses to India's Agricultural Strategy,
W72-00173 3F

Appraisal and Management of Water Resources in South Africa,
W72-00186 6B

Positive Incentives And Negative Controls,
W72-00239 5G

ECONOMIC IMPACT
The Great Lakes Container Dilemma,
W72-00385 6C

ECONOMIC JUSTIFICATION
Biological--Gamma-Radiation System for Sewage Processing,
W72-00383 5D

ECONOMICS
Water-Economics and Politics,
W72-00407 6B

ECONOMIES OF SCALE
Controlling Pollution: The Economics of a Cleaner America,
W72-00459 5G

ECOSYSTEMS
Dams And Ecology--Can They Be Made Compatible,
W72-00116 8A

Subtle Aspects of Ecosystem Management,
W72-00430 6G

EDUCATION
Manpower Requirements and Needs for Waste Water Treatment Facility Operation,
W72-00033 5D

EEL RIVER PROJECT
Development of an HVDC Solid State Back to Back Asynchronous Tie,
W72-00338 8C

EFFLUENT DISCHARGES
A Methodology For Determining Optimum Longitudinal Spacing of Effluent Discharges Into A River,
W72-00047 5B

EFFLUENT QUALITY
Coagulants for Waste Water Treatment,
W72-00014 5D

EFFLUENT STREAMS
A Field Study of Inorganic Nitrogen Oxidation Rates,
W72-00018 5B

EFFLUENTS
A Procedure for Tracing of Kraft Mill Effluent from an Ocean Outfall by Constituent Fluorescence,
W72-00123 5B

Hydraulic and Process Aspects of Reactor Design, II-Response to Variations,
W72-00439 5D

Effluents and Affluence,
W72-00464 5G

ELASTIC WAVES
Study of Natural Stress Distribution in Rock Massifs with the Help of Seismic-acoustic methods,
W72-00079 8E

ELECTRIC POWER PRODUCTION
Power for Tomorrow: The Siting Dilemma,
W72-00269 5G

Licensing of Production and Utilization Facilities--Implementation of National Environmental Policy Act of 1969.
W72-00300 5G

ELECTRODES
Determination of Sodium in Black Liquor Using a Selective Ion Electrode,
W72-00416 5D

ELECTROKINETIC POTENTIAL
Coagulation Of Textile Dye Wastes,
W72-00050 5D

ELECTRONIC EQUIPMENT
Improved Discrete Depth Sampler,
W72-00093 7B

An Automatic Runoff Sampler,
W72-00118 7B

An Automated Test Facility for Rock Mechanics Research,
W72-00344 8E

ELECTRONS
Effects of Radiation on Textile Wastes and Starch Solutions,
W72-00410 5D

ELEVATION
Summer Rainfall over the Santa Catalina Mountains,
W72-00168 2B

EMULSIONS
DESIGN OF A TREATMENT PLANT FOR BAKERY WASTES,
W72-00021 5D

Wastewater Treatment At The Chrysler Corp. Toledo Machining Plant,
W72-00023 5D

ENDOGENOUS GROWTH PHASE
Hydrolysis of Lipids in Wastewater,
W72-00421 5D

ENERGY DISSIPATORS
Design of a Circular Hydraulic Jump,
W72-00074 8B

ENERGY EXCHANGE
A Global Classification of Solar Radiation,

W72-00169 2D

ENGINEERING
Values in the Control of Environment,
W72-00404 5G

ENGLAND
Oil Upon the Waters,
W72-00289 5G

ENVIRONMENT
Global Environmental Monitoring,
W72-00162 5C

Radioactive Waste and the Environment,
W72-00193 5B

Interstate Environmental Compact.
W72-00205 6E

Environmental Policy and Management,
W72-00390 6B

Applications of Program Budgeting to Environmental Problems,
W72-00391 6B

The Valuation of Public Goods,
W72-00392 6B

A Return to the Coast,
W72-00393 2L

Values in the Control of Environment,
W72-00404 5G

Man and His Changing Environment,
W72-00405 5G

Technical, Financial, and Administrative Aspects of Water Supply in the Urban Environment in the Americas,
W72-00406 6B

ENVIRONMENTAL CONTROL
Values in the Control of Environment,
W72-00404 5G

ENVIRONMENTAL EFFECTS
Utilization of Interstate Highway Construction to Create Productive Wetlands for Wildlife,
W72-00053 4C

Dams And Ecology--Can They Be Made Compatible,
W72-00116 8A

Residues in Fish, Wildlife, and Estuaries,
W72-00122 5B

Some Ecological Effects on the Use of Paraquat for the Control of Weeds in Small Lakes,
W72-00155 4A

Power for Tomorrow: The Siting Dilemma,
W72-00269 5G

Environmental Considerations in Department of Defense Actions.
W72-00295 6E

Licensing of Production and Utilization Facilities--Implementation of National Environmental Policy Act of 1969.
W72-00300 5G

Oklahoma Copan Lake. Little Caney River, Flood Control, Water Qaulity, Water Supply, Fish and Wildlife and Recreation Lake Located in Washington, County.
W72-00348 6G

Cases and Materials on Environmental Law,
W72-00456 6E

ENVIRONMENTAL ENGINEERING
Sales and Use Tax.
W72-00266 6E

ENVIRONMENTAL GRADIENT
Subtle Aspects of Ecosystem Management,
W72-00430 6G

ENVIRONMENTAL IMPACT STATEMENTS
Oklahoma Copan Lake. Little Caney River, Flood Control, Water Qaulity, Water Supply, Fish and Wildlife and Recreation Lake Located in Washington, County.
W72-00348 6G

ENVIRONMENTAL POLICY
Environmental Policy and Management,
W72-00390 6B

ENVIRONMENTAL PROBLEMS
Applications of Program Budgeting to Environmental Problems,
W72-00391 6B

Man and His Changing Environment,
W72-00405 5G

ENVIRONMENTAL PROTECTION AGENCY
State Certification of Activities Requiring Federal License or Permit.
W72-00293 6E

ENVIRONMENTAL QUALITY PROBLEMS
The Valuation of Public Goods,
W72-00392 6B

ENVIRONMENTAL SANITATION
United Kingdom: Oil in Navigable Waters Act of 1971.
W72-00213 6E

Clean Water for Mississippi's Estuaries.
W72-00246 5G

Lawyers as Human Environmentalists Advocate's Environmental Advice,
W72-00252 6E

Suing the Polluter: Approaches to Achieve Standing,
W72-00256 5G

The Challenge of Environmental Quality: An Outline of Remedies to Meet It,
W72-00270 5G

Multi-Media Confrontation--The Environmentalist's Strategy for a 'No-Win' Agency Proceeding,
W72-00286 5G

Control of Estuarine Pollution,
W72-00290 6E

San Francisco Bay-Delta Water Quality Control Program: Final Report.
W72-00454 5G

Transcripts of the Speeches, National Conference on Environmental Law.
W72-00468 6E

The Legal Future: New Theories of Environmental Protection,
W72-00469 6E

Economic and Technical Problems in Environmental Litigation.
W72-00470 6E

The Functions and Features of Private Litigation in the Growth of Environmental Law,
W72-00471 6E

The Legal Profession's Leadership in Rebuilding Environmental Quality,
W72-00472 6E

Environmental Lawyer in the Lion's Mouth: Litigation Before and Against Administrative Agencies,
W72-00473 6E

Defenses and the Role of Industry Lawyers,
W72-00474 6E

ENVIRONMETNAL SURVEYS
Oklahoma Copan Lake. Little Caney River, Flood Control, Water Qaulity, Water Supply, Fish and Wildlife and Recreation Lake Located in Washington, County.
W72-00348 6G

ENZYMES
Development of Immobilized Enzyme Systems for Enhancement of Biological Waste Treatment Processes,
W72-00002 5D

EROSION
Stability of Coastal Plain Surfaces,
W72-00091 2J

Introduction to Fluvial Processes.
W72-00100 2J

World Erosion and Sedimentation,
W72-00101 2J

The Drainage Basin As The Fundamental Geomorphic Unit,
W72-00102 2J

The Role Of Water In Rock Disintegration,
W72-00103 2J

Soil Moisture,
W72-00104 2G

The Geomorphic Effects of Groundwater,
W72-00107 2F

The Geomorphology of Central Australia, (Geomorphologie von Zentralaustralien Nach H. Bremer),
W72-00170 2J

Observations on a Collapsing Kame Terrace in Glacier Bay National Monument, South-Eastern Alaska,
W72-00332 2C

ESTIMATING EQUATIONS
On the Global Solar Radiation Climate and Evapotranspiration Estimates in India,
W72-00180 2D

ESTIMATION METHODOLOGY
Projected Wastewater Treatment Costs in the Organic Chemicals Industry,
W72-00028 5D

ESTUARIES
Residues in Fish, Wildlife, and Estuaries,
W72-00122 5B

Clean Water for Mississippi's Estuaries.
W72-00246 5G

Control of Estuarine Pollution,
W72-00290 6E

Permits to Dredge or Fill in or About Estuarine Waters or State Owned Lakes.
W72-00296 6E

A Return to the Coast,

W72-00393 2L

Some Aspects of the Hydrography of a Relatively Unpolluted Estuary in Southeastern Massachusetts,
W72-00431 5C

EUSTACY
The Quaternary Deltaic and Channel System in the Central Great Valley, California,
W72-00177 2J

EUTROPHICATION
Nitrogen Cycle and Primary Production in Mesotrophic Lake Lucerne (Horwer Bay) and in Eutrophic Red Lake with Special Regard to Nitrates as Limiting Factors (Stickstoff-Kreislauf und Primaproduktion im Mesotrophen Vier-Waldstattrsee (Horwer Bucht) und im Eutrophen Rotsee, mit Besonderer Berucksichtigung des Nitrats als Limitierenden Faktors),
W72-00158 5C

Eutrophication,
W72-00165 5C

City of Bethany V. Municipal Securities Co. (Appealing Party Limited to Defenses Raised at Trial).
W72-00167 6E

Kinetic and Stoichiometric Limitations of Phosphate in Pure and Mixed Bacterial Cultures,
W72-00440 5C

EVALUATION
Positive Incentives And Negative Controls,
W72-00239 5G

Positive Incentives And Negative Controls,
W72-00240 5G

Evaluation of Natural River Environments: Phase II,
W72-00357 6B

Arkansas (Analysis and Comparison with Tennessee Water Pollution Law),
W72-00480 6E

Hawaii (Analysis and Comparison with Present and Proposed Tennessee Water Pollution Law),
W72-00484 6E

Mississippi (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00495 6E

Rhode Island (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00508 6E

South Carolina (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00509 6E

EVALUATIONS
Iowa (Analysis and Comparison with Present and Proposed Tennessee Water Pollution Law),
W72-00486 6E

Kentucky (Analysis and Comparison with Present and Proposed Tennessee Water Pollution Law),
W72-00488 6E

EVAPORATION
Experimental Hydrologic Investigations at Valday (Eksperimental'nyye gidrologicheskiye issledovaniya na Valdaye).
W72-00061 2B

Procedures for Computing Evaporation from 20-Square-Meter Evaporation Pans Based on Observations in GGI-3,000 Evaporimeters (Metodika rascheta ispareniya s basseynov ploshchad'yu 20 m2 po nablyudeniyam v isparitelyakh GGI-3,000),
W72-00062 2D

Characteristics of Evaporation from Industrial Wastes (Osobennosti ispareniya s promyshlennykh stokov),
W72-00063 5B

Effect of Precipitation and Evaporation on Changes in Solution Concentration (Vliyaniye dozhdey i ispareniya na izmeneniye kontsentratsii rastvorov),
W72-00064 5B

Estimation of Intercepted Solid Precipitation and Determination of Evaporation from a Spruce Forest during a Winter Period (Otsenka velichiny zaderzhaniya tverdykh osadkov i opredeleniye ispareniya s yelovogo lesa v zimniy period),
W72-00065 2B

A Global Classification of Solar Radiation,
W72-00169 2D

Cooling Towers,
W72-00337 8D

EVAPORATION PANS
Procedures for Computing Evaporation from 20-Square-Meter Evaporation Pans Based on Observations in GGI-3,000 Evaporimeters (Metodika rascheta ispareniya s basseynov ploshchad'yu 20 m2 po nablyudeniyam v isparitelyakh GGI-3,000),
W72-00062 2D

EVAPOTRANSPIRATION
Osmotic Water Stress: Mesophyll Saturation Deficit and Transpiration Rates of Tamarisk,
W72-00172 2D

On the Global Solar Radiation Climate and Evapotranspiration Estimates in India,
W72-00180 2D

EXCAVATION
Tidal Waters (Excavating and Dredging Regulation).
W72-00297 6E

EXTRA HIGH VOLTAGE
Development of an HVDC Solid State Back to Back Asynchronous Tie,
W72-00338 8C

FARMERS HOME ADMINISTRATION ACT OF 1961
Loans to Rural Areas for Water Supply and Sewage Disposal Systems.
W72-00260 5G

FEDERAL GOVERNMENT
United States V Northwest Paper Co. (Standing to Bring Qui Tam Action under Refuse Act of 1899).
W72-00121 6E

Enquist V Quaker Oats Co. (Standing to Bring Qui Tam Action Under Refuse Act of 1899, and to Seek Injunction).
W72-00140 6E

Section 169: Amortization of Pollution Control Facilities.
W72-00218 5G

Introduction of a Bill to Amend the Clean Air Act and the Federal Water Pollution Control Act,
W72-00241 6E

Federal Water Pollution Legislation and Regulations with Particular Reference to the Oil Industry,
W72-00255 5G

Loans to Rural Areas for Water Supply and Sewage Disposal Systems.
W72-00260 5G

Environmental Considerations in Department of Defense Actions.
W72-00295 6E

Federal Water Pollution Control Act,
W72-00518 6E

Supplement to Federal Program Sections,
W72-00519 6E

FEDERAL JURISDICTION
Classification of Public Lands Valuable for Geothermal Steam and Associated Geothermal Resources,
W72-00096 2F

Maine's Oil Spill Legislation: Can a State with an Extensive Interest in its Coastal Resources Protect Itself from Inadequacies in National and International Law,
W72-00283 5G

FEDERAL POWER ACT
Water Quality Standard Certifications.
W72-00294 6E

FEDERAL WATER POLLUTION CONTROL ACT
Federal Water Pollution Legislation and Regulations with Particular Reference to the Oil Industry,
W72-00255 5G

State Certification of Activities Requiring Federal License or Permit.
W72-00293 6E

The Annual Report of the Council of Economic Advisors, 1966.
W72-00467 5G

FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
Clean Water for Mississippi's Estuaries.
W72-00246 5G

FEEDLOT RUNOFF
Infiltration Rates and Groundwater Quality Beneath Cattle Feedlots, Texas High Plains,
W72-00083 5B

FERTILIZERS
The Nutrient Content of Drainage Water from Agricultural Land,
W72-00157 5C

FILTER CLOTHS
Clarification Of Turbid Water By Filter Fabrics,
W72-00120 5G

FILTER FABRICS
Clarification Of Turbid Water By Filter Fabrics,

W72-00120 5G

FILTERS
Clarification Of Turbid Water By Filter Fabrics,
W72-00120 5G

FILTRATION
The Use of Ultrafiltration Membranes for Activated Sludge Separation,
W72-00034 5D

The Graver C.I. Process Continuous Countercurrent Filtration and Adsorption,
W72-00040 5D

Combined Sewer Overflow Abatement Alternatives: Washington, D.C.,
W72-00082 5D

Treatment of Wastewaters by Pulsed Adsorption Beds,
W72-00425 5D

FINAL SETTLER
A Mathematical Model for a Trickling Filter,
W72-00442 5D

FINANCING
Rural Water And Sanitation Facilities.
W72-00227 6E

The Money Gap - Can States Fill It,
W72-00396 6C

Technical, Financial, and Administrative Aspects of Water Supply in the Urban Environment in the Americas,
W72-00406 6B

FIRN
On the Rates of Growth of Grains and Crystals in South Polar Firn,
W72-00329 2C

FISH CONSERVATION
Protection of Inland Wetlands; Discharge of Waste or Deleterious Substances.
W72-00274 6E

FISH DIETS
Experimental Criteria for Studying Grass Carp Feeding in Relation to Weed Control,
W72-00163 4A

FISH DISEASES
Toxicity of Certain Chemicals to Juvenile Pompano,
W72-00143 5C

FISH EGGS
Survival and Hatching of Walleye Eggs at Various Dissolved Oxygen Levels,
W72-00142 5C

FISH FARMING
The Fishery Potential of Four Aquatic Environments Created by Interstate Route 91 Construction in Massachusetts,
W72-00135 4C

Toxicity of Certain Chemicals to Juvenile Pompano,
W72-00143 5C

FISH MANAGEMENT
The Fishery Potential of Four Aquatic Environments Created by Interstate Route 91 Construction in Massachusetts,
W72-00135 4C

FISH MIGRATION
Interference With Streams and Waters; Protection of Fish and Game.
W72-00261 6E

FISH PHYSIOLOGY
The Influence of Oxygen Concentration on Routine Metabolism of Cyprinus Carpio L. in Different Temperature Conditions, (Influenta Concentratiei de Oxigen Asupra Metabolismului Energetic la Cyprinus Carpio L. in Diferite Conditii de Temperatura),
W72-00144 5C

Comparative Study of the Oxygen Consumption in Ctenopharyngodon Idella and Hypophthalmichthys Molitrix Embryos and Larvae - First Stages, (Cercetari Asupra Metabolimului Energetic la Speciile Ctenopharyngodon Idella si Hypophthalmichthys Molitrix in Stadiile Embrionare si in Primele Stadii Larvare),
W72-00145 5C

FISH POPULATIONS
Biological Investigation of Atlantic Tomcod, Microgadus Tomcod (Walbaum), in the Weweantic River Estuary, Massachusetts, 1967,
W72-00139 5C

FISHING
Waters--Tidal Waters--Power of Legislature to Authorize Pollution of Fisheries.
W72-00215 5G

FLOOD CONTROL
Flood-Plain Management Must Be Ecologically And Economically Sound,
W72-00117 2E

Webers Falls Lock and Dam, Arkansas River Navigation Project: Hydraulic Model Investigation,
W72-00347 8B

Oklahoma Copan Lake. Little Caney River, Flood Control, Water Qaulity, Water Supply, Fish and Wildlife and Recreation Lake Located in Washington, County.
W72-00348 6G

Ansonia-Derby Local Protection Project, Naugatuck and Housatonic Rivers, Connecticut: Hydraulic Model Investigation,
W72-00368 8B

FLOOD DAMAGE
Food Plain Information, Bad River at Fort Pierre, South Dakota.
W72-00055 4A

Flood-Plain Management Must Be Ecologically And Economically Sound,
W72-00117 2E

FLOOD-PLAIN MANAGEMENT
Flood-Plain Management Must Be Ecologically And Economically Sound,
W72-00117 2E

FLOOD PLAINS
Food Plain Information, Bad River at Fort Pierre, South Dakota.
W72-00055 4A

FLOODS
Food Plain Information, Bad River at Fort Pierre, South Dakota.
W72-00055 4A

FLOODS (FORT PIERRE S DAK)
Food Plain Information, Bad River at Fort Pierre, South Dakota.
W72-00055 4A

FLORIDA
Movement-Behavior in Three Species of Colonial-Nesting Wading Birds: A Radio-Telemetric Study,
W72-00051 7B

Air and Water Pollution Control--Permits.
W72-00202 6E

Florida Litter Law of 1971.
W72-00203 6E

Environmental Protection Act.
W72-00204 6E

Interstate Environmental Compact.
W72-00205 6E

Pollution of Waters.
W72-00216 6E

Oil Spill.
W72-00217 6E

Jurisdiction of the Department of Air and Water Pollution Control,
W72-00249 6E

Jurisdiction of the Trustees of the Internal Improvement Trust Fund,
W72-00250 6E

Effect of Humic Acids on Iron Analyses in Natural Waters,
W72-00315 2K

Florida (Analysis and Comparison with Present and Proposed Tennessee Water Pollution Law),
W72-00483 6E

FLOTATION
Precipitate Flotation of Complexed Cyanide,
W72-00029 5D

FLOW AGUMENTATION
Suppression of Channel-Side Chaparral Cover Increases Streamflow,
W72-00054 4A

FLOW CONTROL
Streamflow Routing for Water Pollution Studies,
W72-00124 5G

FLOW MEASUREMENT
Combined Sewer Overflow Abatement Alternatives: Washington, D.C.,
W72-00082 5D

Accuracy of Field Hydrometric Work in Studying Subsurface Flow (Tochnost' ekspeditsionnykh gidrometricheskikh rabot pri izuchenii podzemnogo stoka),
W72-00322 2F

FLOW RESISTANCE
The Relative Role of Stomata in Transpiration and Assimilation,
W72-00175 2D

FLUID BED REACTOR
The Copeland Process Fluid Bed System and Pollution Control World Wide,

W72-00447 5D

FLUID MECHANICS
Design of a Circular Hydraulic Jump,
W72-00074 8B

FLUMES
Experimental Study Of Channel Patterns,
W72-00119 2E

FLUVIAL PROCESSES
World Erosion and Sedimentation,
W72-00101 2J

The Drainage Basin As The Fundamental Geomorphic Unit,
W72-00102 2J

The Role Of Water In Rock Disintegration,
W72-00103 2J

Soil Moisture,
W72-00104 2G

Infiltration, Throughflow, And Overland Flow,
W72-00105 2G

Erosion by Water on Hillslopes,
W72-00106 2J

The Geomorphic Effects of Groundwater,
W72-00107 2F

Open Channel Flow,
W72-00108 8B

Hydraulic Geometry,
W72-00109 8B

Periglacial Morphometry,
W72-00111 2C

Relation Of Morphometry To Runoff Frequency,
W72-00112 2E

Climatic Geomorphology,
W72-00113 2E

Geomorphic Implications of Climatic Changes,
W72-00114 2E

FOOD PROCESSING WASTES
Analysis of Food Processing Wastewaters,
W72-00011 5D

FORECASTING
Rehabilitation of Solid Industrial Wastes Disposal Sites,
W72-00031 5E

Computer Simulation of the Hydrologic-Salinity Flow System within the Upper Colorado River Basin,
W72-00084 7C

Evaluation of Dispersed Pollutional Loads from Urban Areas,
W72-00355 5B

Hydraulic and Process Aspects of Reactor Design, II-Response to Variations,
W72-00439 5D

FOREIGN COUNTRIES
Water Pollution Control In The USSR And Eastern European Countries,
W72-00222 5G

Water Pollution In International Law,
W72-00223 5G

Liability In National And International Law For Damage Through Water Pollution,
W72-00224 5G

Inter-Governmental Maritime Consultative Organization: Draft Convention On Civil Liability For Pollution Damage.
W72-00228 6E

Oil Pollution Problems on the Pacific Coast,
W72-00281 5G

FOREST CONVERSION
How Does Forest-Range Conversion in Ozark Uplands Affect Runoff,
W72-00164 4A

FOREST LITTER
Forest Litter as an Accumulator of Moisture (Lesnaya podstilka--akkumulyator vlagi),
W72-00067 2G

FOREST MANAGEMENT
The Forest Environment--Problems and Promises,
W72-00010 6D

FOREST SOILS
Nature and Extent of Macropores in Forest Soils and Their Influence on Subsurface water Movement,
W72-00313 2G

FORESTS
Estimation of Intercepted Solid Precipitation and Determination of Evaporation from a Spruce Forest during a Winter Period (Otsenka velichiny zaderzhaniya tverdykh osadkov i opredeleniye ispareniya s yelovogo lesa v zimniy period),
W72-00065 2B

How Does Forest-Range Conversion in Ozark Uplands Affect Runoff,
W72-00164 4A

FORMALDEHYDE
Toxicity of Certain Chemicals to Juvenile Pompano,
W72-00143 5C

FOSTER SAYERS RESERVOIR (PENN)
Chemical and Biological Conditions in Bald Eagle Creek and Prognosis of Trophic Characteristics of Foster Joseph Sayers Reservoir, Centre County, Pennsylvania,
W72-00129 5C

FREEZING
Pressures Inside Freezing Water Drops,
W72-00088 2C

Study of Ice-Lens Formation Patterns (Issledovaniye zakonomernostey formirovaniya naledey),
W72-00323 2F

Treatment by Freezing,
W72-00436 5D

FRESH WATER
The Chemical States of Copper in Polluted Fresh Water and a Scheme of Analysis to Differentiate Them,
W72-00126 5B

FRESHWATER MARSHES
Protection of Inland Wetlands; Discharge of Waste or Deleterious Substances.
W72-00274 6E

FROZEN GROUND
Periglacial Morphometry,
W72-00111 2C

Study of Ice-Lens Formation Patterns (Issledovaniye zakonomernostey formirovaniya naledey),
W72-00323 2F

Thermodynamics and Composition of the Liquid Water Phase in Frozen Peat with Application to Infiltration Studies (K voprosu o faxovom sostave vody i teplofizicheskikh kharakteristikakh merzlogo torfa pri izuchenii infil' tratsii),
W72-00327 2F

FROZEN SOILS
Thermodynamics and Composition of the Liquid Water Phase in Frozen Peat with Application to Infiltration Studies (K voprosu o faxovom sostave vody i teplofizicheskikh kharakteristikakh merzlogo torfa pri izuchenii infil' tratsii),
W72-00327 2F

FUNDING
The Money Gap - Can States Fill It,
W72-00396 6C

FUNDING POLICY
The Evolution of a Funding Policy,
W72-00395 6B

FUNGI
Microfungi in the Water, Mud, and Litter of a Cattail Marsh,
W72-00151 5C

FUTURE PLANNING (PROJECTED)
Positive Incentives And Negative Controls,
W72-00240 5G

GAGES
Analysis of Wave Records,
W72-00350 7B

Comparison of Pressure and Staff Wave Gage Records,
W72-00352 7B

GAGING STATIONS
Index of Surface-Water Records to September 30, 1970--Part 10. The Great Basin.
W72-00098 7C

Index of Surface-Water Records to September 30, 1970--Part 15. Alaska.
W72-00099 7C

GAS ABSORPTION SYSTEMS
Gas Absorption in a Heterogeneous System,
W72-00085 5A

GASES
Gas Absorption in a Heterogeneous System,
W72-00085 5A

GASTROPODS
Effects of Copper on Gammarus Pseudolimnaeus, Physa Integra, and Campeloma Decisum in Soft Water,
W72-00148 5C

GATES
Navigation Conditions at Hannibal Locks and Dam, Ohio and West Virginia: Hydraulic Model Investigation,
W72-00373 8B

GEOGRAPHY
Introduction to Fluvial Processes.

W72-00100 2J

GEOLOGY
Distribution of Moisture in the Unsaturated Profile on a Piedmont Watershed,
W72-00308 2G

GEOMORPHOLOGY
Stability of Coastal Plain Surfaces,
W72-00091 2J

Introduction to Fluvial Processes.
W72-00100 2J

The Drainage Basin As The Fundamental Geomorphic Unit,
W72-00102 2J

The Geomorphic Effects of Groundwater,
W72-00107 2F

The Geomorphology And Morphometry Of Glacial And Nival Areas,
W72-00110 2C

Periglacial Morphometry,
W72-00111 2C

Climatic Geomorphology,
W72-00113 2E

Geomorphic Implications of Climatic Changes,
W72-00114 2E

The Geomorphology of Central Australia, (Geomorphologie von Zentralaustralien Nach H. Bremer),
W72-00170 2J

Observations on a Collapsing Kame Terrace in Glacier Bay National Monument, South-Eastern Alaska,
W72-00332 2C

GEOTHERMAL INVESTIGATIONS
Geothermal Exploration,
W72-00077 2F

GEOTHERMAL PROSPECTING
Geothermal Exploration,
W72-00077 2F

GEOTHERMAL RESOURCES
Geothermal Exploration,
W72-00077 2F

Classification of Public Lands Valuable for Geothermal Steam and Associated Geothermal Resources,
W72-00096 2F

GEOTHERMAL STEAM
Classification of Public Lands Valuable for Geothermal Steam and Associated Geothermal Resources,
W72-00096 2F

GEOTHERMAL STUDIES
Geothermal Exploration,
W72-00077 2F

Classification of Public Lands Valuable for Geothermal Steam and Associated Geothermal Resources,
W72-00096 2F

GIBBSITE
Gibbsite in Coastal Plain Soils, Southeastern United States,
W72-00090 2G

GLACIAL DRIFT
Observations on a Collapsing Kame Terrace in Glacier Bay National Monument, South-Eastern Alaska,
W72-00332 2C

GLACIATION
The Geomorphology And Morphometry Of Glacial And Nival Areas,
W72-00110 2C

GLACIER DYNAMICS
The Dynamics of Temperature Glaciers from the Detailed Viewpoint,
W72-00087 2C

GLACIERS
Inventory of Glaciers in the North Cascades, Washington,
W72-00060 7C

The Dynamics of Temperature Glaciers from the Detailed Viewpoint,
W72-00087 2C

Elexure of a Floating Ice Tongue,
W72-00330 2C

GLACIOFLUVIAL MATERIAL
Investigation of Techniques to Provide Advance Warning of Ground-water Pollution Hazards with Special Reference to Aquifers in Glacial Outwash,
W72-00358 5B

GLOBAL MONITORING
Global Environmental Monitoring,
W72-00162 5C

GLUCONIC ACID
Gas Absorption in a Heterogeneous System,
W72-00085 5A

GLUCOSE
Gas Absorption in a Heterogeneous System,
W72-00085 5A

GOVERNMENT FINANCE
North Carolina Pollution Abatement and Industrial Facilities Financing Act.
W72-00304 6E

GOVERNMENT SUPPORTS
Some Aspects of Resource Use in Relation to the Orange River Project,
W72-00185 3F

GOVERNMENTS
Water Pollution Control In The USSR And Eastern European Countries,
W72-00222 5G

Nourishing Public Participation,
W72-00394 6B

The Evolution of a Funding Policy,
W72-00395 6B

GRAND RAPIDS (MICH)
Direct Digtal Control at Grand Rapids, Michigan,
W72-00043 5D

GRANTS
Sewer Construction.
W72-00291 6E

GRAZING
Some Aspects of Resource Use in Relation to the Orange River Project,
W72-00185 3F

GREAT BASIN
Index of Surface-Water Records to September 30, 1970--Part 10. The Great Basin.
W72-00098 7C

GREAT LAKES
Great Lakes Pollution,
W72-00247 5G

The Great Lakes Container Dilemma,
W72-00385 6C

GROUNDWATER
Infiltration Rates and Groundwater Quality Beneath Cattle Feedlots, Texas High Plains,
W72-00083 5B

Estimation of Groundwater Recharge by Atmospheric Precipitation with Few or no Observations of the Groundwater Regime (Metod otsenki pitaniya gruntovykh vod atmosfernymi osadkami pri nedostatochnosti ili otsutstvii nablyudeniy za rezhimom gruntovykh vod),
W72-00324 2F

Effect of Intensive Groundwater use on Streamflow (Ob issledovanii vliyaniya intensivnoy ekspluatatsii podzemnykh vod na stok rek),
W72-00325 2F

GROUNDWATER BASINS
Estimation of Groundwater Recharge by Atmospheric Precipitation with Few or no Observations of the Groundwater Regime (Metod otsenki pitaniya gruntovykh vod atmosfernymi osadkami pri nedostatochnosti ili otsutstvii nablyudeniy za rezhimom gruntovykh vod),
W72-00324 2F

GROUNDWATER MINING
Effect of Intensive Groundwater use on Streamflow (Ob issledovanii vliyaniya intensivnoy ekspluatatsii podzemnykh vod na stok rek),
W72-00325 2F

GROUNDWATER MOVEMENT
Infiltration, Throughflow, And Overland Flow,
W72-00105 2G

The Geomorphic Effects of Groundwater,
W72-00107 2F

Distribution of Moisture in the Unsaturated Profile on a Piedmont Watershed,
W72-00308 2G

Ditch Drainage of Anisotropic Nonhomogeneous Porous Media: A Model Study,
W72-00309 2G

Nature and Extent of Macropores in Forest Soils and Their Influence on Subsurface water Movement,
W72-00313 2G

Effect of Intensive Groundwater use on Streamflow (Ob issledovanii vliyaniya intensivnoy ekspluatatsii podzemnykh vod na stok rek),
W72-00325 2F

GROUNDWATER POLLUTION
Investigation of Techniques to Provide Advance Warning of Ground-water Pollution Hazards with Special Reference to Aquifers in Glacial Outwash,
W72-00358 5B

GROUNDWATER RECHARGE
Clarification Of Turbid Water By Filter Fabrics,

W72-00120 5G

Distribution of Moisture in the Unsaturated Profile on a Piedmont Watershed,
W72-00308 2G

Estimation of Groundwater Recharge by Atmospheric Precipitation with Few or no Observations of the Groundwater Regime (Metod otsenki pitaniya gruntovykh vod atmosfernymi osadkami pri nedostatochnosti ili otsutstvii nablyudeniy za rezhimom gruntovykh vod),
W72-00324 2F

Effect of Intensive Groundwater use on Streamflow (Ob issledovanii vliyaniya intensivnoy ekspluatatsii podzemnykh vod na stok rek),
W72-00325 2F

GROWTH RATES
The Fishery Potential of Four Aquatic Environments Created by Interstate Route 91 Construction in Massachusetts,
W72-00135 4C

GULF OF MEXICO
A Method of Tracing Sediment Movement on the Texas Gulf Coast,
W72-00314 2J

GULLY EROSION
Erosion by Water on Hillslopes,
W72-00106 2J

GUYED TOWERS
Nelson River HVDC Transmission Line Towers,
W72-00339 8C

HABITATS
Utilization of Interstate Highway Construction to Create Productive Wetlands for Wildlife,
W72-00053 4C

HARBORS
Expansion of Santa Barbara Harbor, California. Hydraulic Model Investigation,
W72-00349 6B

Expansion and Revision of Kawaihae Harbor, Hawaii: Hydraulic Model Investigation,
W72-00364 8B

Design for Expansion of Port San Luis, California; Hydraulic Model Investigation,
W72-00366 8B

Wave Action in Mission Bay Harbor, California: Hydraulic Model Investigation,
W72-00367 8B

HATCHING
Survival and Hatching of Walleye Eggs at Various Dissolved Oxygen Levels,
W72-00142 5C

HAWAII
Hawaii (Analysis and Comparison with Present and Proposed Tennessee Water Pollution Law),
W72-00484 6E

HAZARDS
Radioactive Waste and the Environment,
W72-00193 5B

Hazards of Mercury, Special Report to the Secretary's Pesticide Advisory Committee, Department of Health, Education, and Welfare.
W72-00374 5B

HEAT TRANSFER
Development of a Stability Correction for Estimating Convective Transfer,
W72-00316 2B

HEAVY METALS
Missouri Stream Studies Relating to the 'New Lead Belt',
W72-00089 5B

Hazards of Mercury, Special Report to the Secretary's Pesticide Advisory Committee, Department of Health, Education, and Welfare.
W72-00374 5B

HERBICIDES
Residues in Fish, Wildlife, and Estuaries,
W72-00122 5B

Influence of Several Species of Aquatic Plants on Dichlobenil Residues in Water,
W72-00137 5C

Some Ecological Effects on the Use of Paraquat for the Control of Weeds in Small Lakes,
W72-00155 4A

HIGH VOLTAGE
Hvdc transmission Control Schemes.
W72-00342 8C

HIGHWAY EFFECTS
Utilization of Interstate Highway Construction to Create Productive Wetlands for Wildlife,
W72-00053 4C

The Fishery Potential of Four Aquatic Environments Created by Interstate Route 91 Construction in Massachusetts,
W72-00135 4C

HIGHWAYS
Utilization of Interstate Highway Construction to Create Productive Wetlands for Wildlife,
W72-00053 4C

HILLSLOPE EROSION
Erosion by Water on Hillslopes,
W72-00106 2J

HOUSTON SHIP CHANNEL
How we Got the Dirtiest Stream in America,
W72-00282 5G

HUMIC ACIDS
Effect of Humic Acids on Iron Analyses in Natural Waters,
W72-00315 2K

HURRICANES
Shoreline Orientation and Storm Surge,
W72-00132 2J

HYDRATION
Water Structure as a Determinant of Ion Distribution in Living Tissue,
W72-00207 1B

HYDRAULIC CONDUCTIVITY
Effect of Temperature on Pressure Head-water Content Relationship and Conductivity of Two Soils,
W72-00312 2G

HYDRAULIC DESIGN
Design of a Circular Hydraulic Jump,
W72-00074 8B

HYDRAULIC GRADIENT
Hydraulic Geometry,
W72-00109 8B

HYDRAULIC JUMP
Design of a Circular Hydraulic Jump,
W72-00074 8B

HYDRAULIC MODELS
Stochastic Difference Equation Modelling of Hydrologic Processes,
W72-00306 2A

Effect of Rainfall on the Resistance in Channels with Shallow Flow,
W72-00307 8B

Effect of Valve Position in a Sidewall Port Filling System, Newburgh Lock, Ohio River: Hydraulic Model Investigation,
W72-00346 8B

Webers Falls Lock and Dam, Arkansas River Navigation Project: Hydraulic Model Investigation,
W72-00347 8B

Expansion of Santa Barbara Harbor, California. Hydraulic Model Investigation,
W72-00349 6B

Jones Bluff Lock and Dam, Alabama River Navigation Project: Hydraulic Model Investigation,
W72-00359 8B

Navigation Conditions in Fort Smith Reach, Arkansas River. Hydraulic Model Investigation,
W72-00360 8B

Mechanics of Flow from Stratified Reservoirs in the Interest of Water Quality: Hydraulic Laboratory Investigation,
W72-00361 5F

Expansion and Revision of Kawaihae Harbor, Hawaii: Hydraulic Model Investigation,
W72-00364 8B

Navigation Conditions at Lock and Dam No. 7, Arkansas River: Hydraulic Model Investigation,
W72-00365 8B

Wave Action in Mission Bay Harbor, California: Hydraulic Model Investigation,
W72-00367 8B

Ansonia-Derby Local Protection Project, Naugatuck and Housatonic Rivers, Connecticut: Hydraulic Model Investigation,
W72-00368 8B

Outlet Works for Beltzville Dam, Pohopoco Creek, Pennsylvania: Hydraulic Model Investigation,
W72-00369 8B

Wave Action and Breakwater Location, Noyo Harbor, California: Hydraulic Model Investigation,
W72-00370 8B

Outlet Works for New Hope Reservoir Cape Fear River Basin, North Carolina: Hydraulic Model Investigation,
W72-00371 8B

Spillway for Kaysinger Bluff Dam Osage River, Missouri, Hydraulic Model Investigation,
W72-00372 8B

Navigation Conditions at Hannibal Locks and Dam, Ohio and West Virginia: Hydraulic Model Investigation,
W72-00373 8B

HYDRAULIC VALVES
Effect of Valve Position in a Sidewall Port Filling System, Newburgh Lock, Ohio River: Hydraulic Model Investigation,

W72-00346 8B

HYDRO-ECONOMIC ANALYSIS
Appraisal and Management of Water Resources in South Africa,
W72-00186 6B

HYDROELECTRIC POWER
Water Quality Standard Certifications.
W72-00294 6E

HYDROGEN CHLORIDE
Horizontal HCl Pickling Line at Fukuyama,
W72-00004 5D

HYDROGEOLOGY
Soil Moisture,
W72-00104 2G

HYDROLIC DATA
Inventory of Glaciers in the North Cascades, Washington,
W72-00060 7C

HYDROLOGIC DATA
Annual Compilation and Analysis of Hydrologic Data for Elm Fork Trinity River, Trinity River Basin, Texas, 1969,
W72-00097 7C

Streamflow, Sediment-Transport, And Water-Temperature Characteristics Of Three Small Watersheds In The Alsea River Basin, Oregon,
W72-00115 2E

Measurement of Interflow and Deep Seepage on Piedmont Watersheds,
W72-00311 2G

HYDROLYSIS
Hydrolysis of Lipids in Wastewater,
W72-00421 5D

HYDROMETRY
Accuracy of Field Hydrometric Work in Studying Subsurface Flow (Tochnost' ekspeditsionnykh gidrometricheskikh rabot pri izuchenii podzemnogo stoka),
W72-00322 2F

ICE
Pressures Inside Freezing Water Drops,
W72-00088 2C

Exotic Pebbles in Quaternary Deposits from the South Coast of the St. Lawrence Estuary, Quebec,
W72-00134 2L

Study of Ice-Lens Formation Patterns (Issledovaniye zakonomernostey formirovaniya naledey),
W72-00323 2F

On the Rates of Growth of Grains and Crystals in South Polar Firn,
W72-00329 2C

Elexure of a Floating Ice Tongue,
W72-00330 2C

The Mechanical Properties of Single Crystals of Pure Ice,
W72-00336 2C

ICE BREAKUP
Spring Breakup of the Delta River, Alaska,
W72-00094 2C

ICE CRYSTALS
The Mechanical Properties of Single Crystals of Pure Ice,
W72-00336 2C

ICE LENSES
Study of Ice-Lens Formation Patterns (Issledovaniye zakonomernostey formirovaniya naledey),
W72-00323 2F

ILLINOIS
Water Quality Standards (Interstate Waters, Lake Michigan and Little Calumet River, Grand Calumet River and Wolf Lake).
W72-00196 5G

In the Matter of Mercury Standards.
W72-00279 5G

ILLINOIS RIVER
Water Quality Standards (Interstate Waters, Illinois River and Lower Section of Des Plaines River),
W72-00195 6E

ILLINOISE
Water Quality Standards (Interstate Waters, Illinois River and Lower Section of Des Plaines River),
W72-00195 6E

IMMOBILIZATION
Development of Immobilized Enzyme Systems for Enhancement of Biological Waste Treatment Processes,
W72-00002 5D

IMPAIRED WATER QUALITY
Chemical and Biological Conditions in Bald Eagle Creek and Prognosis of Trophic Characteristics of Foster Joseph Sayers Reservoir, Centre County, Pennsylvania,
W72-00129 5C

Costs and Effects of a Water Quality Program for a Small Strip Mining Company,
W72-00388 5G

INDEX
Index of Surface-Water Records to September 30, 1970--Part 10. The Great Basin.
W72-00098 7C

Index of Surface-Water Records to September 30, 1970--Part 15. Alaska.
W72-00099 7C

INDIA
Varied Responses to India's Agricultural Strategy,
W72-00173 3F

Pakistan's Water Problems and the Law of International Rivers,
W72-00179 6E

On the Global Solar Radiation Climate and Evapotranspiration Estimates in India,
W72-00180 2D

INDIANA
Pollution of Waters of State.
W72-00095 6E

Indiana (Analysis and Comparison with Tennessee Water Pollution Law),
W72-00485 6E

INDICATORS
The Use of Biological Analyses as Indicators of Water Quality,
W72-00154 5A

INDIVIDUAL
Values in the Control of Environment,
W72-00404 5G

INDUSTRIAL PRODUCTION
Introduction of a Bill to Amend the Clean Air Act and the Federal Water Pollution Control Act,
W72-00241 6E

INDUSTRIAL USE (WATER)
Studies of Municipal Wastewater Renovation For Industrial Water,
W72-00045 5D

INDUSTRIAL WASTES
Bio-regenerated Activated Carbon Treatment of Textile Dye Wastewaters,
W72-00003 5D

Analysis of Food Processing Wastewaters,
W72-00011 5D

Centrifuges in Water and Waste Treatment,
W72-00016 5D

Process Control of Centrifuge Operations,
W72-00017 5D

Wastewater Treatment At The Chrysler Corp. Toledo Machining Plant,
W72-00023 5D

Operation of a Treatment Works Handling the Wastes from the Processing of Truck Bodies,
W72-00026 5D

Experience in the Treatment and Re-use of Industrial Waste Waters,
W72-00027 5D

Rehabilitation of Solid Industrial Wastes Disposal Sites,
W72-00031 5E

SUBMARINE DISPOSAL OF INDUSTRIAL WASTE,
W72-00041 5E

Characteristics of Evaporation from Industrial Wastes (Osobennosti ispareniya s promyshlennykh stokov),
W72-00063 5B

A Procedure for Tracing of Kraft Mill Effluent from an Ocean Outfall by Constituent Fluorescence,
W72-00123 5B

Tax Treatment of Pollution Control Facilities.
W72-00243 5D

Farmers Chemical Ass'n v. Union Camp Co. (Denial of Jury Trial When Injunction Sought to Abate Pollution).
W72-00343 6E

Use and Abuse of Natural Water Systems,
W72-00380 5D

Reduction of Salt Content of Food Processing Liquid Waste Effluent,
W72-00409 5D

Effects of Radiation on Textile Wastes and Starch Solutions,
W72-00410 5D

Industrial Effluents of the Northwest,
W72-00427 5G

Treatment of Wastes from Meat Flour Factories,

W72-00437 5D

Anaerobic Lagoons Versus Aerated Lagoons in the Treatment of Packing-House Wastes,
W72-00441 5D

Purification of Wastes From a German Yeast Plant,
W72-00446 5D

INDUSTRY
Defenses and the Role of Industry Lawyers,
W72-00474 6E

.INEAR ALKYLATE SULPHONATES
The Effect of Surface Active Agents on Substrate Utilization in an Experimental Activated Sludge System,
W72-00035 5D

INFILTRATION
Infiltration Rates and Groundwater Quality Beneath Cattle Feedlots, Texas High Plains,
W72-00083 5B

Infiltration, Throughflow, And Overland Flow,
W72-00105 2G

Thermodynamics and Composition of the Liquid Water Phase in Frozen Peat with Application to Infiltration Studies (K voprosu o faxovom sostave vody i teplofizicheskikh kharakteristikakh merzlogo torfa pri izuchenii infil' tratsii),
W72-00327 2F

INFORMATION CONTENT (ECOLOGY)
Vegetation Studies in the Simpson Desert, N.T.,
W72-00182 2I

INFORMATION THEORY
Optimum Sample Sizes for Concrete Cylinder Tests Using Information Theory,
W72-00076 8F

INHIBITION
The Effect of Surface Active Agents on Substrate Utilization in an Experimental Activated Sludge System,
W72-00035 5D

INJUNCTION (PROHIBITORY)
Farmers Chemical Ass'n v. Union Camp Co. (Denial of Jury Trial When Injunction Sought to Abate Pollution).
W72-00343 6E

INORGANIC COMPOUNDS
Precipitate Flotation of Complexed Cyanide,
W72-00029 5D

INPUT-OUTPUT ANALYSIS
Characteristics and Filtering of Noise in Linear Hydrologic Systems,
W72-00310 2A

Linear Systems Analysis in Hydrology--The Transform approach, the Kernel Oscillations and the Effect of Noise,
W72-00317 2A

INSECTS
Some Aspects of Water Balance in Tenebrionid Beetles and a Thysanuran From the Namib Desert of Southern Africa,
W72-00184 2I

INSPECTION
Model Law to Improve Dam Safety,
W72-00073 6E

INSTITUTIONAL ASPECTS
The Evolution of a Funding Policy,
W72-00395 6B

The Money Gap - Can States Fill It,
W72-00396 6C

INSTITUTIONAL CONSTRAINTS
Goals And Strategies For Combating International Pollution,
W72-00235 5G

International Cooperation To Curb Fluvial And Maritime Pollution,
W72-00236 5G

Positive Incentives And Negative Controls,
W72-00240 5G

INSTRUMENTATION
Some Simple Devices for the Study of Wave Induced Surges,
W72-00056 2E

The Bristol Fall Column for Coarse Sediment Grading,
W72-00057 2J

Design and Operation of a Triaxial, High-Temperature, High-Pressure Compaction Apparatus,
W72-00058 2J

Precise Sediment Density Determination by Gamma-Ray Attenuation Alone,
W72-00059 2J

Improved Discrete Depth Sampler,
W72-00093 7B

An Automatic Runoff Sampler,
W72-00118 7B

Measurement of Interflow and Deep Seepage on Piedmont Watersheds,
W72-00311 2G

Feasibility of Computer Control of Wastewater Treatment.
W72-00408 5D

INSURANCE
The 1969 Brussels Convention On Civil Liability For Oil Pollution,
W72-00238 5G

An Act Concerning the Insurance or Bonding of Oil Companies and Carriers.
W72-00245 6E

INTAKE STRUCTURES
Outlet Works for Beltzville Dam, Pohopoco Creek, Pennsylvania: Hydraulic Model Investigation,
W72-00369 8B

INTER-BASIN TRANSFERS
Interbasin Transfers: Do We Need Them,
W72-00402 6D

INTERCONNECTED SYSTEMS
Development of an HVDC Solid State Back to Back Asynchronous Tie,
W72-00338 8C

INTERDISCIPLINARY COMMUNICATION
Environmental Policy and Management,
W72-00390 6B

INTERFACES
Treatment of Wastewaters by Pulsed Adsorption Beds,
W72-00425 5D

INTERFLOW
Measurement of Interflow and Deep Seepage on Piedmont Watersheds,
W72-00311 2G

INTERNATIONAL COMMISSIONS
River Pollution in International Law,
W72-00450 5G

INTERNATIONAL LAW
Pakistan's Water Problems and the Law of International Rivers,
W72-00179 6E

Contract Regarding an Interim Supplement to Tanker Liability for Oil Pollution.
W72-00191 5G

Water Pollution In International Law,
W72-00223 5G

Liability In National And International Law For Damage Through Water Pollution,
W72-00224 5G

Inability Of Traditional Forms Of Political Order To Adapt To Modern Problems Of International Pollution,
W72-00233 5G

International Developments In Water Pollution Control: Principles Of Responsibility: Continental Europe,
W72-00234 5G

Goals And Strategies For Combating International Pollution,
W72-00235 5G

International Cooperation To Curb Fluvial And Maritime Pollution,
W72-00236 5G

United States Mission To The United Nations,
W72-00237 5G

The 1969 Brussels Convention On Civil Liability For Oil Pollution,
W72-00238 5G

Tanker Owners Voluntary Agreement Concerning Liability for Oil Pollution.
W72-00248 6E

Principles of Responsibility in International Law,
W72-00251 6E

Oil Pollution Control in the Canadian Arctic,
W72-00254 5G

Oil Upon the Waters,
W72-00289 5G

River Pollution in International Law,
W72-00450 5G

INTERNATIONAL WATERS
Atlantic Ocean Pollution and Biota Observed by the 'RA' Expeditions,
W72-00147 5C

Pakistan's Water Problems and the Law of International Rivers,
W72-00179 6E

Inter-Governmental Maritime Consultative Organization: Draft Convention On Rights Of Coastal States To Intervene In Casualties On The High Seas Causing Oil Pollution.
W72-00229 6E

International Law and Pollution of International Rivers and Lakes,
W72-00280 5G

INTERSTATE COMPACTS
Interstate Environmental Compact.

W72-00205 6E

Interstate Water Pollution Control.
W72-00397 6E

INTERSTATE RIVERS
Effluents and Affluence,
W72-00464 5G

INVENTORIES
Evaluation of Natural River Environments: Phase II,
W72-00357 6B

INVESTMENT
The Great Lakes Container Dilemma,
W72-00385 6C

Multistage Marginal Cost Model of Investment-Pricing Decisions: Application to Urban Water Supply Treatment Facilities,
W72-00386 6C

INVESTMENT-PRICING DECISION
Multistage Marginal Cost Model of Investment-Pricing Decisions: Application to Urban Water Supply Treatment Facilities,
W72-00386 6C

ION EXCHANGE
The Graver C.I. Process Continuous Countercurrent Filtration and Adsorption,
W72-00040 5D

ION EXCHANGE DESULFATION
Study of Unconventional Methods for Brine Concentration,
W72-00379 3A

IONIZATION
Determination of Sodium in Black Liquor Using a Selective Ion Electrode,
W72-00416 5D

IONS
Water Structure as a Determinant of Ion Distribution in Living Tissue,
W72-00207 1B

IOWA
Rules and Regulations--Water Quality Standards.
W72-00194 5G

Iowa (Analysis and Comparison with Present and Proposed Tennessee Water Pollution Law),
W72-00486 6E

IRAQ
Range Ecology at the Institute,
W72-00166 3F

IRON
Acquisition of Surface Lands for Water Quality Control.
W72-00275 6E

Effect of Humic Acids on Iron Analyses in Natural Waters,
W72-00315 2K

Anaerobic Digestion of Sludges Containing Iron Phosphates,
W72-00414 5D

IRON SOLUBILITY
Effect of Humic Acids on Iron Analyses in Natural Waters,
W72-00315 2K

IRRADIATION
Effects of Radiation on Textile Wastes and Starch Solutions,
W72-00410 5D

IRRIGATED LAND
Design Considerations for Agricultural Drains on the Columbia Basin Project,
W72-00341 8B

IRRIGATION
A Model for the Economic Evaluation of Water Quality in Irrigation,
W72-00382 3F

IRRIGATION EFFICIENCY
Computer Simulation of the Hydrologic-Salinity Flow System within the Upper Colorado River Basin,
W72-00084 7C

Varied Responses to India's Agricultural Strategy,
W72-00173 3F

IRRIGATION SYSTEMS
Pressure Distribution on a Center-pivot Sprinkler Irrigation System,
W72-00078 8B

IRRIGATION WATER
A Model for the Economic Evaluation of Water Quality in Irrigation,
W72-00382 3F

ISOELECTRIC POINT
A Study Of Color Removal From Textile Dye Wastes By Chemical Coagulation,
W72-00049 5D

Coagulation Of Textile Dye Wastes,
W72-00050 5D

JUDICIAL DECISIONS
Amenities Rights--Parallels to Pollution Taxes,
W72-00192 5G

Cases and Materials on Environmental Law,
W72-00456 6E

Economic and Technical Problems in Environmental Litigation.
W72-00470 6E

Environmental Lawyer in the Lion's Mouth: Litigation Before and Against Administrative Agencies,
W72-00473 6E

KANSAS
Agricultural And Related Wastes Control.
W72-00231 5G

Water Quality Criteria for Specified River Basins.
W72-00449 5G

Peterson V. Texas Co. (Liability for Damages Caused by Escape Wastes from Oil Lease),
W72-00458 6E

Kansas (Analysis and Comparison of Kansas and Tennessee Water Pollution Law),
W72-00487 6E

KARST
The Geomorphic Effects of Groundwater,
W72-00107 2F

KENTUCKY
Kentucky (Analysis and Comparison with Present and Proposed Tennessee Water Pollution Law),
W72-00488 6E

KINETICS
Kinetic Aanalysis of Data from Biological Systems,
W72-00007 5D

LABORATORY EQUIPMENT
The Importance of Avoiding Chemical Contamination for a Successful Cultivation of Marine Organisms,
W72-00149 5C

LABORATORY TESTS
Kinetic Aanalysis of Data from Biological Systems,
W72-00007 5D

Effect of Rainfall on the Resistance in Channels with Shallow Flow,
W72-00307 8B

LAGOONS
Anaerobic Lagoons Versus Aerated Lagoons in the Treatment of Packing-House Wastes,
W72-00441 5D

LAKE LUCERNE (SWITZERLAND)
Nitrogen Cycle and Primary Production in Mesotrophic Lake Lucerne (Horwer Bay) and in Eutrophic Red Lake with Special Regard to Nitrates as Limiting Factors (Stickstoff-Kreislauf und Primaproduktion im Mesotrophen Vier-Waldstattrsee (Horwer Bucht) und im Eutrophen Rotsee, mit Besonderer Berucksichtigung des Nitrats als Limitierenden Faktors),
W72-00158 5C

LAKE MICHIGAN
Water Quality Standards (Interstate Waters, Lake Michigan and Little Calumet River, Grand Calumet River and Wolf Lake).
W72-00196 5G

LAND CLASSIFICATION
Classification of Public Lands Valuable for Geothermal Steam and Associated Geothermal Resources,
W72-00096 2F

LAND FORMING
The Drainage Basin As The Fundamental Geomorphic Unit,
W72-00102 2J

The Geomorphic Effects of Groundwater,
W72-00107 2F

The Geomorphology And Morphometry Of Glacial And Nival Areas,
W72-00110 2C

Periglacial Morphometry,
W72-00111 2C

Climatic Geomorphology,
W72-00113 2E

Geomorphic Implications of Climatic Changes,
W72-00114 2E

The Geomorphology of Central Australia, (Geomorphologie von Zentralaustralien Nach H. Bremer),
W72-00170 2J

LAND RECLAMATION
Rules and Regulations for Mineral Exploration.

W72-00285 6E

LAND TENURE
Landowner's Right to Relief Against Pollution of His Water Supply by Industrial or Commercial Waste,
W72-00452 6E

LAND USE
The Forest Environment--Problems and Promises,
W72-00010 6D

Control of Estuarine Pollution,
W72-00290 6E

Evaluation of Dispersed Pollutional Loads from Urban Areas,
W72-00355 5B

LANDFILLS
Rehabilitation of Solid Industrial Wastes Disposal Sites,
W72-00031 5E

Jurisdiction of the Trustees of the Internal Improvement Trust Fund,
W72-00250 6E

LATIN AMERICA
Technical, Financial, and Administrative Aspects of Water Supply in the Urban Environment in the Americas,
W72-00406 6B

LEACHING
Pollutants Leached from Selected Species of Wood in Log Storage Waters,
W72-00019 5B

The Nutrient Content of Drainage Water from Agricultural Land,
W72-00157 5C

LEAD MINING (MO)
Missouri Stream Studies Relating to the 'New Lead Belt',
W72-00089 5B

LEAF MESOPHYLL SURFACE
Osmotic Water Stress: Mesophyll Saturation Deficit and Transpiration Rates of Tamarisk,
W72-00172 2D

LEAKAGE
Scurlock Oil Co. V. Harrell (Action for Damages to Land and Water from Oil Pipeline Leakage).
W72-00353 6E

LEAVES
The Effect of Air Temperature and Moisture Stress Upon Leaf Surface Temperatures of Calotropis Procera (Willd.) R. Br.,
W72-00183 2I

LEGAL ASPECTS
Environmental Protection Act.
W72-00204 6E

Interstate Environmental Compact.
W72-00205 6E

Proposed Regulations of the Department of Interior on Oil Pollution Under the Water Quality Improvement Act of 1970.
W72-00259 5G

Mid-Continent Pipeline Co v Crauthers (Release of Servant Tortfeasor).
W72-00413 6E

River Pollution in International Law,
W72-00450 5G

Cases and Materials on Environmental Law,
W72-00456 6E

Transcripts of the Speeches, National Conference on Environmental Law.
W72-00468 6E

Economic and Technical Problems in Environmental Litigation.
W72-00470 6E

The Functions and Features of Private Litigation in the Growth of Environmental Law,
W72-00471 6E

The Legal Profession's Leadership in Rebuilding Environmental Quality,
W72-00472 6E

Wyoming (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00517 6E

LEGISLATION
The Use of the Corps of Engineers Permit Authority as a Tool for Defending the Environment,
W72-00253 5G

Federal Water Pollution Legislation and Regulations with Particular Reference to the Oil Industry,
W72-00255 5G

Ross V. Fink (Statute Prohibiting Salt Water Flow Over Surface of Land Inapplicable to Pollution by Underground Waters).
W72-00387 6E

Pollution Problems in the Petroleum Industry--Construction of and Compliance with Federal and State Laws,
W72-00455 5G

Water Pollution Control Programs.
W72-00457 5G

The Legal Future: New Theories of Environmental Protection,
W72-00469 6E

The Legal Profession's Leadership in Rebuilding Environmental Quality,
W72-00472 6E

The 1971 Water Pollution Study for the State of Tennessee,
W72-00475 6E

Tennessee Water Quality Control Act of 1971 with Commentary,
W72-00476 6E

Florida (Analysis and Comparison with Present and Proposed Tennessee Water Pollution Law),
W72-00483 6E

Indiana (Analysis and Comparison with Tennessee Water Pollution Law),
W72-00485 6E

Ohio (Analysis of State's Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00504 6E

Virginia (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00513 6E

Washington (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00514 6E

Supplement to Federal Program Sections,
W72-00519 6E

LETHAL LIMIT
Toxicity of Certain Chemicals to Juvenile Pompano,
W72-00143 5C

Effects of Copper on Gammarus Pseudolimnaeus, Physa Integra, and Campeloma Decisum in Soft Water,
W72-00148 5C

The Importance of Avoiding Chemical Contamination for a Successful Cultivation of Marine Organisms,
W72-00149 5C

LEVEES
Ansonia-Derby Local Protection Project, Naugatuck and Housatonic Rivers, Connecticut: Hydraulic Model Investigation,
W72-00368 8B

LIFE CYCLES
Biological Investigation of Atlantic Tomcod, Microgadus Tomcod (Walbaum), in the Weweantic River Estuary, Massachusetts, 1967,
W72-00139 5C

LIFE HISTORY STUDIES
Biological Investigation of Atlantic Tomcod, Microgadus Tomcod (Walbaum), in the Weweantic River Estuary, Massachusetts, 1967,
W72-00139 5C

LIME
Phosphate Removal by pH Controlled Lime Dosage,
W72-00415 5D

LIME-BEARING WASTE WATER
Clarification of the Lime Bearing Wastes from a Sole Leather Tannery,
W72-00434 5D

LINEAR PROGRAMMING
Multi-time Period, Facilities Location Problems: A Heuristic Algorithm With Applications To Wastewater Treatment Systems,
W72-00048 5D

Evaluation Strategies and Water Resource Development,
W72-00429 6B

LIPIDS
Hydrolysis of Lipids in Wastewater,
W72-00421 5D

LITTER
Microfungi in the Water, Mud, and Litter of a Cattail Marsh,
W72-00151 5C

LITTERING
Public Perception of Environmental Quality in Tucson, Arizona,
W72-00174 5G

LITTLE BLUE HERONS
Movement-Behavior in Three Species of Colonial-Nesting Wading Birds: A Radio-Telemetric Study,

W72-00051 7B

LITTORAL DRIFT
A Method of Tracing Sediment Movement on the Texas Gulf Coast,
W72-00314 2J

LIVESTOCK
Sunray Oil Co. V. Burge (Action Against Petroleum Product Manufacturer for Damage to Livestock from Drinking Poisonous Water.
W72-00401 6E

LIVESTOCK WASTES
Cattle Feedlots and Alternatives for Waste Management,
W72-00428 5G

LOANS
Loans to Rural Areas for Water Supply and Sewage Disposal Systems.
W72-00260 5G

LOCAL GOVERNMENTS
Prevention of Stream Pollution by Sawdust; Powers of Local Government Concerning Water Supplies.
W72-00389 6E

LOCKS
Effect of Valve Position in a Sidewall Port Filling System, Newburgh Lock, Ohio River: Hydraulic Model Investigation,
W72-00346 8B

Webers Falls Lock and Dam, Arkansas River Navigation Project: Hydraulic Model Investigation,
W72-00347 8B

LOCKS (WATERWAYS)
Jones Bluff Lock and Dam, Alabama River Navigation Project: Hydraulic Model Investigation,
W72-00359 8B

Navigation Conditions in Fort Smith Reach, Arkansas River. Hydraulic Model Investigation,
W72-00360 8B

Navigation Conditions at Lock and Dam No. 3, Arkansas River, Arkansas and Oklahoma, Hydraulic Model Investigation,
W72-00362 8B

Navigation Conditions at Lock and Dam No. 7, Arkansas River: Hydraulic Model Investigation,
W72-00365 8B

Navigation Conditions at Hannibal Locks and Dam, Ohio and West Virginia: Hydraulic Model Investigation,
W72-00373 8B

LOG STORAGE WATERS
Pollutants Leached from Selected Species of Wood in Log Storage Waters,
W72-00019 5B

LOGGING (RECORDING)
United Kingdom: Oil in Navigable Waters Act of 1971.
W72-00213 6E

LONG LAKE (WASH)
Preliminary Investigation of the Low Dissolved Oxygen Concentrations that Exist in Long Lake Located Near Spokane, Washington,
W72-00156 5C

LOUISIANA
Louisiana (Analysis of State's Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00489 6E

LOW FLOW
Role of Artesian Water in the Formation of Streamflow as Illustrated by the Tosna River (Otsenka roli napornykh podzemnykh vod v formirovanii rechnogo stoka na primere r. Tosny),
W72-00321 2F

Perennial Fluctuations of Minimum Streamflow in the European USSR During a Winter Period (Nekotoryye zakonomernosti mnogoletnikh kolebaniy minimal'nogo stoka rek ETS v zimniy period),
W72-00328 2F

LYSIS
Disinfection of Algal Laden Waters,
W72-00411 5D

MACROPORES
Nature and Extent of Macropores in Forest Soils and Their Influence on Subsurface water Movement,
W72-00313 2G

MAINE
Maine's Oil Spill Legislation: Can a State with an Extensive Interest in its Coastal Resources Protect Itself from Inadequacies in National and International Law,
W72-00283 5G

Interstate Water Pollution Control.
W72-00397 6E

Maine (Analysis of State's Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00490 6E

MANAGEMENT
Environmental Policy and Management,
W72-00390 6B

The Evolution of a Funding Policy,
W72-00395 6B

MANAGEMENT CONTROL
The Evolution of a Funding Policy,
W72-00395 6B

MANPOWER
Manpower Requirements and Needs for Waste Water Treatment Facility Operation,
W72-00033 5D

MAPPING
A Global Classification of Solar Radiation,
W72-00169 2D

MARGINAL COSTS
Multistage Marginal Cost Model of Investment-Pricing Decisions: Application to Urban Water Supply Treatment Facilities,
W72-00386 6C

MARINE BIOLOGY (SAMPLING)
Improved Discrete Depth Sampler,
W72-00093 7B

MARSHES
Microfungi in the Water, Mud, and Litter of a Cattail Marsh,
W72-00151 5C

MARYLAND
Maryland (Analysis of Maryland Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00491 6E

MASS TRANSFER
The Case for Deep Aeration Tanks,
W72-00015 5D

Gas Absorption in a Heterogeneous System,
W72-00085 5A

An Experimental Valuation of the Intra-particle Resistance in Substrate Transfer to Suspended Zoogloeal Particles,
W72-00433 5D

MASS WASTING
Observations on a Collapsing Kame Terrace in Glacier Bay National Monument, South-Eastern Alaska,
W72-00332 2C

MASSACHUSETTS
Management Model for Terrestrial Wildlife Based on Energy Relationships,
W72-00052 6G

Protection of Inland Wetlands; Discharge of Waste or Deleterious Substances.
W72-00274 6E

Massachusetts (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00492 6E

MATHEMATICAL MODEL
A Mathematical Model for a Trickling Filter,
W72-00442 5D

MATHEMATICAL MODELS
Multi-time Period, Facilities Location Problems: A Heuristic Algorithm With Applications To Wastewater Treatment Systems,
W72-00048 5D

Management Model for Terrestrial Wildlife Based on Energy Relationships,
W72-00052 6G

Dispatching System for Control of Combined Sewer Losses,
W72-00080 5G

Characteristics and Filtering of Noise in Linear Hydrologic Systems,
W72-00310 2A

Waves Generated by Piston-Type Wavemaker,
W72-00351 8B

A Model for the Economic Evaluation of Water Quality in Irrigation,
W72-00382 3F

Multistage Marginal Cost Model of Investment-Pricing Decisions: Application to Urban Water Supply Treatment Facilities,
W72-00386 6C

MATHEMATICAL STUDIES
A Methodology For Determining Optimum Longitudinal Spacing of Effluent Discharges Into A River,
W72-00047 5B

Streamflow Routing for Water Pollution Studies,

MATHEMATICAL STUDIES
W72-00124 5G

Stochastic Difference Equation Modelling of Hydrologic Processes,
W72-00306 2A

Development of a Stability Correction for Estimating Convective Transfer,
W72-00316 2B

MEASUREMENT
Tentative Application of a Telethermometer for Measurement of Water-surface Temperature (Opyt primeneniya distantsionnoy ustanovki dlya izmereniya temperatury poverkhnosti vody),
W72-00070 2H

MEAT FLOUR FACTORIES
Treatment of Wastes from Meat Flour Factories,
W72-00437 5D

MEKONG VALLEY
General Studies on Trematodes in Thailand: Classification of Cerceriae in Thailand,
W72-00138 5C

MELT WATER
Methods of Calculating Melt-water Percolation (Sposoby rascheta prosachivaniya talykh vod),
W72-00068 2G

MELTING
Albedo and Degree of Puddling of a Melting Cover of Sea Ice,
W72-00331 2C

MEMBRANES
The Use of Ultrafiltration Membranes for Activated Sludge Separation,
W72-00034 5D

MERCAPTANS
Adsorption of Sulfur Containing Taste and Odor Compounds on Activated Carbon,
W72-00423 5D

MERCURY
Hazards of Mercury, Special Report to the Secretary's Pesticide Advisory Committee, Department of Health, Education, and Welfare.
W72-00374 5B

METABOLIC PROBLEMS
The Metabolism of Cities,
W72-00403 6B

METHODOLOGY
Methods for Chemical Analysis of Waters and Wastewaters,
W72-00086 2K

METHYLMERCURY
Hazards of Mercury, Special Report to the Secretary's Pesticide Advisory Committee, Department of Health, Education, and Welfare.
W72-00374 5B

MICHAELIS-MENTEN EQUATION
Kinetic Aanalysis of Data from Biological Systems,
W72-00007 5D

MICHIGAN
Interstate and Intrastate Water Temperature Standards for Protection of Fish and Aquatic Life.
W72-00198 5G

Summary of Water Quality Standards for Designated use Areas in Michigan Interstate Waters.
W72-00199 5G

How your Michigan Water Resources Commission Protects Michigan's Lakes and Streams.
W72-00200 6E

Michigan's Intrastate Water Quality Standards--Intrastate Use Designation Areas.
W72-00201 5G

Acquisition of Surface Lands for Water Quality Control.
W72-00275 6E

Mineral Well Act.
W72-00276 6E

Thomas J. Anderson, Gordon Rockwell Environmental Protection Act of 1970.
W72-00277 6E

Public Bathing Beaches.
W72-00278 6E

Sewer Construction.
W72-00291 6E

Michigan (Analysis of Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00493 6E

MILITARY ASPECTS
Environmental Considerations in Department of Defense Actions.
W72-00295 6E

MINE DRAINAGE
Costs and Effects of a Water Quality Program for a Small Strip Mining Company,
W72-00388 5G

MINE WASTES
Missouri Stream Studies Relating to the 'New Lead Belt',
W72-00089 5B

MINERAL INDUSTRY
Rules and Regulations for Mineral Exploration.
W72-00285 6E

MINERAL WATERS
Mineral Well Act.
W72-00276 6E

MINING
Missouri Stream Studies Relating to the 'New Lead Belt',
W72-00089 5B

MINNESOTA
Water Pollution Control Act.
W72-00262 6E

Pollution Control Agency.
W72-00263 6E

Minnesota (Analysis of State's Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00494 6E

MISSISSIPPI
Clean Water for Mississippi's Estuaries.
W72-00246 5G

Water Pollution Control.
W72-00267 6E

Water Pollution Abatement Grants to Subdivision of the State.
W72-00268 6E

Mississippi (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00495 6E

MISSOURI
Missouri Stream Studies Relating to the 'New Lead Belt',
W72-00089 5B

Sewage Disposal.
W72-00265 6E

Sales and Use Tax.
W72-00266 6E

MIXED BACTERIAL CULTURES
Kinetic and Stoichiometric Limitations of Phosphate in Pure and Mixed Bacterial Cultures,
W72-00440 5C

MIXING
Problems in Obtaining Adequate Sewage Disinfection,
W72-00419 5D

MODEL ASSUMPTIONS
Multistage Marginal Cost Model of Investment-Pricing Decisions: Application to Urban Water Supply Treatment Facilities,
W72-00386 6C

MODEL STUDIES
Computer Simulation of the Hydrologic-Salinity Flow System within the Upper Colorado River Basin,
W72-00084 7C

Experimental Study Of Channel Patterns,
W72-00119 2E

Streamflow Routing for Water Pollution Studies,
W72-00124 5G

Model for Iso-Osmotic Water Flow in Plant Roots,
W72-00178 2I

Stochastic Difference Equation Modelling of Hydrologic Processes,
W72-00306 2A

Effect of Rainfall on the Resistance in Channels with Shallow Flow,
W72-00307 8B

Ditch Drainage of Anisotropic Nonhomogeneous Porous Media: A Model Study,
W72-00309 2G

Linear Systems Analysis in Hydrology--The Transform approach, the Kernel Oscillations and the Effect of Noise,
W72-00317 2A

Evaluation of Dispersed Pollutional Loads from Urban Areas,
W72-00355 5B

MOISTURE CONTENT
Forest Litter as an Accumulator of Moisture (Lesnaya podstilka--akkumulyator vlagi),
W72-00067 2G

Methods of Calculating Melt-water Percolation (Sposoby rascheta prosachivaniya talykh vod),

W72-00068 2G

MOLECULAR STRUCTURE
Water Structure as a Determinant of Ion Distribution in Living Tissue,
W72-00207 1B

MOLLUSKS
General Studies on Trematodes in Thailand: Classification of Cercariae in Thailand,
W72-00138 5C

MOMENTUM EQUATION
Design of a Circular Hydraulic Jump,
W72-00074 8B

MONETARY BENEFITS
Pollution Plant Equipment-Tax Benefits.
W72-00273 6E

MONEY GAP
The Money Gap - Can States Fill It,
W72-00396 6C

MONITORING
New Applications of On-stream Analysers in Pulp Mills,
W72-00009 5A

The Automatic Detection of Low Levels of Dissolved Free Chlorine in Fish Farming Experiments Using Seawater Effluents,
W72-00141 5C

Global Environmental Monitoring,
W72-00162 5C

New York's Water Quality Surveillance Program,
W72-00424 5G

Annual User Surveillance Fee,
W72-00520 6E

MONTANA
Possible Liabilities Arising from Violations of Conservation Orders,
W72-00220 6E

Rules and Regulations for Mineral Exploration.
W72-00285 6E

Performance of an Atmospheric Water Resources Research Program in the Hungry Horse Area, Montana, 1969-70 Season.
W72-00375 3B

Montana (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00496 6E

MONTE CARLO METHOD
Monte Carlo Study of Seismic Structural Safety,
W72-00072 7C

MOUNT CLEMENS (MICH)
Combined Wastewater Collection And Treatment Facility, Mount Clemens, Michigan,
W72-00042 5D

MOUNTAINS
Summer Rainfall over the Santa Catalina Mountains,
W72-00168 2B

MOVEMENT
The Dynamics of Temperature Glaciers from the Detailed Viewpoint,
W72-00087 2C

MUD
Microfungi in the Water, Mud, and Litter of a Cattail Marsh,
W72-00151 5C

MULTIPLE PURPOSE
Effects of Reservoir Operating Policy on Recreation Benefits,
W72-00399 4A

MUNICIPAL WASTES
Centrifuges in Water and Waste Treatment,
W72-00016 5D

Process Control of Centrifuge Operations,
W72-00017 5D

Studies of Municipal Wastewater Renovation For Industrial Water,
W72-00045 5D

Use and Abuse of Natural Water Systems,
W72-00380 5D

Town of Braggs V. Slape (Liability for Damages Caused by Municipal Discharge of Raw Sewage).
W72-00460 6E

Kinnischtzke V. City of Glen Ullin (Liability of Municipality Discharging Inadequately Treated Sewage).
W72-00544 6E

MUNICIPAL WATER
Prevention of Stream Pollution by Sawdust; Powers of Local Government Concerning Water Supplies.
W72-00389 6E

NAKWASINA RIVER (ALASKA)
Residues in Fish, Wildlife, and Estuaries,
W72-00122 5B

NAMIB DESERT
Some Aspects of Water Balance in Tenebrionid Beetles and a Thysanuran From the Namib Desert of Southern Africa,
W72-00184 2I

NATIONAL CONFERENCE ON ENVIRONMENTAL LAW
Transcripts of the Speeches, National Conference on Environmental Law.
W72-00468 6E

NATIONAL ENVIRONMENTAL POLICY ACT
Environmental Considerations in Department of Defense Actions.
W72-00295 6E

NATURAL STREAMS
Chemistry of Natural waters - III Carbonic Acid,
W72-00127 5A

Effect of Humic Acids on Iron Analyses in Natural Waters,
W72-00315 2K

NAVIGABLE RIVERS
Federal Water Pollution Control Act,
W72-00518 6E

NAVIGABLE WATERS
Waters--Tidal Waters--Power of Legislature to Authorize Pollution of Fisheries.
W72-00215 5G

State Certification of Activities Requiring Federal License or Permit.
W72-00293 6E

NAVIGATION
Jones Bluff Lock and Dam, Alabama River Navigation Project: Hydraulic Model Investigation,
W72-00359 8B

NEBRASKA
Nebraska (Analysis of State's Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00497 6E

NET RADIATION
On the Global Solar Radiation Climate and Evapotranspiration Estimates in India,
W72-00180 2D

NEVADA
Water Supply for the Future in Southern Nevada.
W72-00181 6D

Prevention of Stream Pollution by Sawdust; Powers of Local Government Concerning Water Supplies.
W72-00389 6E

Nevada (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00498 6E

NEW ENGLAND INTERSTATE WPS COMPACT
New England Interstate Water Pollution Control Commission.
W72-00287 5G

Effluents and Affluence,
W72-00464 5G

NEW HAMPSHIRE
Tidal Waters (Excavating and Dredging Regulation).
W72-00297 6E

New Hampshire (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00499 6E

NEW JERSEY
Regulations Concerning Treatment of Wastewaters, Domestic and Industrial, Separately or in Combination, Discharged into the Waters of the Hackensack River.
W72-00206 5D

Regulations Concerning Treatment of Wastewaters, Domestic and Industrial Separately or in Combination, Discharged into the Waters of the Atlantic Coastal Plain, Including the Atlantic Ocean.
W72-00208 5D

Regulations Concerning Treatment of Wastewaters, Domestic and Industrial, Separately or in Combination, Discharged into the Waters of the Wallkill River Basin.
W72-00209 5D

Regulations Concerning Treatment of Wastewaters, Domestic and Industrial, Separately or in Combination, Discharged into the Waters of the Passaic River Including the Newark Bay.
W72-00210 5D

Regulations Concerning Treatment of Wastewaters, Domestic and Industrial, Separately or in Combination, Discharged into the Waters of the Raritan River Basin Including the Raritan Bay.

W72-00211 5D

Regulations Concerning Treatment of Wastewaters, Domestic and Industrial, Separately or in Combination, Discharged into the Waters of the Delaware River Basin.
W72-00212 5D

Rules and Regulations Establishing Surface Water Quality Criteria.
W72-00219 5G

New Jersey Water Quality Improvement Act of 1971.
W72-00298 6E

Clean Ocean Act.
W72-00302 6E

New Jersey (Analysis of State's Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00500 6E

NEW MEXICO
New Mexico (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00501 6E

NEW YORK
Permits for New Outlets and Disposal Systems.
W72-00189 5G

New England Interstate Water Pollution Control Commission.
W72-00287 5G

New York (Analysis of State's Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00502 6E

NITRATE
Development of a Chemical Denitrification Process,
W72-00001 5D

NITRATES
Infiltration Rates and Groundwater Quality Beneath Cattle Feedlots, Texas High Plains,
W72-00083 5B

NITRIFICATION
A Field Study of Inorganic Nitrogen Oxidation Rates,
W72-00018 5B

Implications of Nitrogenous BOD in Treatment Plant Design,
W72-00420 5D

NITROGEN CYCLE
Dynamics of the Nitrogen Cycle in Lakes,
W72-00354 5C

NITROGEN FIXATION
Dynamics of the Nitrogen Cycle in Lakes,
W72-00354 5C

NITROGEN METABOLISM
Dynamics of the Nitrogen Cycle in Lakes,
W72-00354 5C

NITROGENOUS OXYGEN DEMAND
A Field Study of Inorganic Nitrogen (Rates,
W72-00018 5B

NOISE
Operational and Maintenance Experience In Screening Digested Sludge,
W72-00044 5D

NOISE FILTERING (SYSTEMS ANALYSIS)
Characteristics and Filtering of Noise in Linear Hydrologic Systems,
W72-00310 2A

NORTH CAROLINA
Organic Carbon in Sediments of the North Carolina Continental Rise,
W72-00092 2J

Permits to Dredge or Fill in or About Estuarine Waters or State Owned Lakes.
W72-00296 6E

Navigable Waters: Certain Practices Regulated.
W72-00303 6E

North Carolina Pollution Abatement and Industrial Facilities Financing Act.
W72-00304 6E

NORTH DAKOTA
North Dakota (Analysis of State's Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00503 6E

Kinnischtzke V. City of Glen Ullin (Liability of Municipality Discharging Inadequately Treated Sewage).
W72-00544 6E

NUCLEAR MOISTURE METERS
Precise Sediment Density Determination by Gamma-Ray Attenuation Alone,
W72-00059 2J

NUCLEAR POWERPLANTS
Licensing of Production and Utilization Facilities--Implementation of National Environmental Policy Act of 1969.
W72-00300 5G

NUCLEATION
Possible Effects of Human Activity on World Climate,
W72-00171 5C

NUISANCE
Colorado (Analysis and Comparison with Tennessee Water Pollution Law),
W72-00482 6E

NUTRIENTS
Chemical and Biological Conditions in Bald Eagle Creek and Prognosis of Trophic Characteristics of Foster Joseph Sayers Reservoir, Centre County, Pennsylvania,
W72-00129 5C

The Nutrient Content of Drainage Water from Agricultural Land,
W72-00157 5C

OBSERVATION WELLS
Design Considerations for Agricultural Drains on the Columbia Basin Project,
W72-00341 8B

OCEAN OUTFALL DESIGN
Ocean Outfall Design: Part I - Literature Review and Theoretical Development,
W72-00356 5B

OCEAN OUTFALLS
SUBMARINE DISPOSAL OF INDUSTRIAL WASTE,
W72-00041 5E

OCEANS
Operational and Maintenance Experience In Screening Digested Sludge,
W72-00044 5D

A Procedure for Tracing of Kraft Mill Effluent from an Ocean Outfall by Constituent Fluorescence,
W72-00123 5B

Inability Of Traditional Forms Of Political Order To Adapt To Modern Problems Of International Pollution,
W72-00233 5G

Goals And Strategies For Combating International Pollution,
W72-00235 5G

United States Mission To The United Nations,
W72-00237 5G

Principles of Responsibility in International Law,
W72-00251 6E

A Bill to Amend the Fish and Wildlife Coordination Act in Order to Protect Marine Environment by Regulating the Dumping of Wastes in the Coastal and Ocean Waters of the United States.
W72-00292 6E

OGALLALA FORMATION
Infiltration Rates and Groundwater Quality Beneath Cattle Feedlots, Texas High Plains,
W72-00083 5B

OHIO
Resolution Establishing Amended Criteria of Stream Water Quality for Various Uses Adopted by the Board on April 14, 1970.
W72-00188 5G

Costs and Effects of a Water Quality Program for a Small Strip Mining Company,
W72-00388 5G

Ohio (Analysis of State's Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00504 6E

OHIO RIVER
Reaeration through Low Dams in the Ohio River,
W72-00032 5G

OIL
Wastewater Treatment At The Chrysler Corp. Toledo Machining Plant,
W72-00023 5D

United Kingdom: Oil in Navigable Waters Act of 1971.
W72-00213 6E

Inter-Governmental Maritime Consultative Organization: Draft Convention On Rights Of Coastal States To Intervene In Casualties On The High Seas Causing Oil Pollution.
W72-00229 6E

Oil Pollution Control in the Canadian Arctic,
W72-00254 5G

Licensing and Regulation of use of Oil Spill Cleanup Agents.
W72-00264 6E

Oil Pollution Problems on the Pacific Coast,
W72-00281 5G

Terminals for the Loading or Discharge of Petroleum or Chemical Liquids or Products from Vessels.

W72-00299 5G

Scurlock Oil Co. V. Harrell (Action for Damages to Land and Water from Oil Pipeline Leakage).
W72-00353 6E

OIL FIELDS
Thompson V. Walsh (Injury to Cattle Resulting From Stream Pollution by Oil Lessee).
W72-00400 6E

OIL INDUSTRY
Contract Regarding an Interim Supplement to Tanker Liability for Oil Pollution.
W72-00191 5G

Possible Liabilities Arising from Violations of Conservation Orders,
W72-00220 6E

Inter-Governmental Maritime Consultative Organization: Draft Convention On Civil Liability For Pollution Damage.
W72-00228 6E

Tanker Owners Voluntary Agreement Concerning Liability for Oil Pollution.
W72-00248 6E

Federal Water Pollution Legislation and Regulations with Particular Reference to the Oil Industry,
W72-00255 5G

Tort Liability and the Oil and Gas Industry,
W72-00257 5G

Maine's Oil Spill Legislation: Can a State with an Extensive Interest in its Coastal Resources Protect Itself from Inadequacies in National and International Law,
W72-00283 5G

National Oil and Hazardous Substances Pollution Contingency Plan.
W72-00301 6E

Pollution Problems in the Petroleum Industry--Construction of and Compliance with Federal and State Laws,
W72-00455 5G

OIL SPILLAGE
Oil Spill.
W72-00217 6E

OIL WASTES
Treatment of Refinery Wastes by Physico Chemical Processes,
W72-00005 5D

Zarrow V Hughes (Liability for Oil and Salt Water Overflow from Oil Well).
W72-00146 6E

Atlantic Ocean Pollution and Biota Observed by the 'RA' Expeditions,
W72-00147 5C

Jackson V. Clark (Necessity of Causal Relationship Between Pollution Damage and the Conduct of a Defendant).
W72-00159 6E

International Convention For The Prevention Of Pollution Of The Sea By Oil, 1954 (As Amended).
W72-00230 6E

An Act Concerning the Insurance or Bonding of Oil Companies and Carriers.
W72-00245 6E

Proposed Regulations of the Department of Interior on Oil Pollution Under the Water Quality Improvement Act of 1970.
W72-00259 5G

Phillips V. Altman (Covenant Not to Sue as a Defense to a Public Nuisance),
W72-00335 6E

Sunray Oil Co. V. Burge (Action Against Petroleum Product Manufacturer for Damage to Livestock from Drinking Poisonous Water.
W72-00401 6E

North v. Evans (Damage to Land from Salt Water Discharged from Oil Wells).
W72-00466 6E

OIL WELLS
Pickens V. Harrison (Damages to Irrigation Well Caused by Salt Water Pollution from Oil Well).
W72-00214 6E

Peterson V. Texas Co. (Liability for Damages Caused by Escape Wastes from Oil Lease),
W72-00458 6E

Wood Oil Co. v. Vendicott (Damage to Realty and Personalty from Oil Wells).
W72-00465 6E

OILY WATER
Magnolia Pipeline Co V. State (Actions of a Third Party as Defense to Pollution Prosecution).
W72-00160 6E

Inter-Governmental Maritime Consultative Organization: Draft Convention On Civil Liability For Pollution Damage.
W72-00228 6E

Oil Upon the Waters,
W72-00289 5G

OKLAHOMA
Hall-Jones Oil Co. v Corporation Commission (Denial of Permit to Dispose of Saline Water).
W72-00006 6E

Zarrow V Hughes (Liability for Oil and Salt Water Overflow from Oil Well).
W72-00146 6E

Jackson V. Clark (Necessity of Causal Relationship Between Pollution Damage and the Conduct of a Defendant).
W72-00159 6E

Magnolia Pipeline Co V. State (Actions of a Third Party as Defense to Pollution Prosecution).
W72-00160 6E

City of Bethany V. Municipal Securities Co. (Appealing Party Limited to Defenses Raised at Trial).
W72-00167 6E

Phillips V. Altman (Covenant Not to Sue as a Defense to a Public Nuisance),
W72-00335 6E

Ross V. Fink (Statute Prohibiting Salt Water Flow Over Surface of Land Inapplicable to Pollution by Underground Waters).
W72-00387 6E

Thompson V. Walsh (Injury to Cattle Resulting From Stream Pollution by Oil Lessee).
W72-00400 6E

Sunray Oil Co. V. Burge (Action Against Petroleum Product Manufacturer for Damage to Livestock from Drinking Poisonous Water.
W72-00401 6E

Mid-Continent Pipeline Co v Crauthers (Release of Servant Tortfeasor).
W72-00413 6E

Town of Braggs V. Slape (Liability for Damages Caused by Municipal Discharge of Raw Sewage).
W72-00460 6E

City of Bethany v. Twin Lakes Gun Club (Measuring Damages to Plaintiff's Lake from Pollution from City Sewage Disposal Plant).
W72-00461 6E

Pure Oil v. Renton (Action for Damages to Realty from Pollution of Stream by Saline Water).
W72-00463 6E

Wood Oil Co. v. Vendicott (Damage to Realty and Personalty from Oil Wells).
W72-00465 6E

North v. Evans (Damage to Land from Salt Water Discharged from Oil Wells).
W72-00466 6E

Oklahoma (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00505 6E

Magnolia Petroleum Co. V. McGeeley (Payment for Void Easements as Offset to Recovery for Pollution Damages).
W72-00543 6E

ON-STREAM ANALYSIS
New Applications of On-stream Analysers in Pulp Mills,
W72-00009 5A

OPEN CHANNEL FLOW
Open Channel Flow,
W72-00108 8B

Ditch Drainage of Anisotropic Nonhomogeneous Porous Media: A Model Study,
W72-00309 2G

OPERATING COSTS
Pressure Distribution on a Center-pivot Sprinkler Irrigation System,
W72-00078 8B

OPERATION AND MAINTENANCE
Operational and Maintenance Experience In Screening Digested Sludge,
W72-00044 5D

OREGON
The Challenge of Environmental Quality: An Outline of Remedies to Meet It,
W72-00270 5G

Oregon (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00506 6E

ORGANIC ACIDS
Chemistry of Natural waters - III Carbonic Acid,

W72-00127 5A

ORGANIC COMPOUND BREAKDOWN
Effects of Radiation on Textile Wastes and Starch Solutions,
W72-00410 5D

ORGANIC COMPOUNDS
Method of a New Differential Thermal Analysis,
W72-00030 5A

ORGANIC MATTER
Organic Carbon in Sediments of the North Carolina Continental Rise,
W72-00092 2J

OSMOTIC PRESSURE
Model for Iso-Osmotic Water Flow in Plant Roots,
W72-00178 2I

OUTLET WORKS
Outlet Works for Beltzville Dam, Pohopoco Creek, Pennsylvania: Hydraulic Model Investigation,
W72-00369 8B

Outlet Works for New Hope Reservoir Cape Fear River Basin, North Carolina: Hydraulic Model Investigation,
W72-00371 8B

OUTLETS
A Methodology For Determining Optimum Longitudinal Spacing of Effluent Discharges Into A River,
W72-00047 5B

Ocean Outfall Design: Part I - Literature Review and Theoretical Development,
W72-00356 5B

OVERFLOW
Dispatching System for Control of Combined Sewer Losses,
W72-00080 5G

Combined Sewer Overflow Abatement Alternatives: Washington, D.C.,
W72-00082 5D

OVERLAND FLOW
Infiltration, Throughflow, And Overland Flow,
W72-00105 2G

OWNERSHIP OF BEDS
Waters--Tidal Waters--Power of Legislature to Authorize Pollution of Fisheries.
W72-00215 5G

OXIDATION LAGOONS
Chlorination Dynamics in Wastewater Effluents,
W72-00422 5D

OXYGEN
Gas Absorption in a Heterogeneous System,
W72-00085 5A

OXYGEN DEMAND
The Influence of Oxygen Concentration on Routine Metabolism of Cyprinus Carpio L. in Different Temperature Conditions, (Influenta Concentratiei de Oxigen Asupra Metabolismului Energetic la Cyprinus Carpio L. in Diferite Conditii de Temperatura),
W72-00144 5C

Comparative Study of the Oxygen Consumption in Ctenopharyngodon Idella and Hypophthalmichthys Molitrix Embryos and Larvae - First Stages, (Cercetari Asupra Metabolimului Energetic la Speciile Ctenopharyngodon Idella si Hypophthalmichthys Molitrix in Stadiile Embrionare si in Primele Stadii Larvare),
W72-00145 5C

OXYGEN FREE ATMOSPHERES
The Effects of Various Atmospheres on the Oxidation of Coal Mine Pyrites,
W72-00081 5G

OXYGEN REQUIREMENTS
Survival and Hatching of Walleye Eggs at Various Dissolved Oxygen Levels,
W72-00142 5C

The Influence of Oxygen Concentration on Routine Metabolism of Cyprinus Carpio L. in Different Temperature Conditions, (Influenta Concentratiei de Oxigen Asupra Metabolismului Energetic la Cyprinus Carpio L. in Diferite Conditii de Temperatura),
W72-00144 5C

OZARKS
How Does Forest-Range Conversion in Ozark Uplands Affect Runoff,
W72-00164 4A

PACIFIC OCEAN
Oil Pollution Problems on the Pacific Coast,
W72-00281 5G

PAPER MILL WASTES
A Procedure for Tracing of Kraft Mill Effluent from an Ocean Outfall by Constituent Fluorescence,
W72-00123 5B

PARAQUAT
Some Ecological Effects on the Use of Paraquat for the Control of Weeds in Small Lakes,
W72-00155 4A

PARKS
Parks and Recreation--Sanitation.
W72-00288 5G

PARTICLE SIZE
Clarification Of Turbid Water By Filter Fabrics,
W72-00120 5G

PASTURES
Town of Braggs V. Slape (Liability for Damages Caused by Municipal Discharge of Raw Sewage).
W72-00460 6E

PATH OF POLLUTANTS
Hazards of Mercury, Special Report to the Secretary's Pesticide Advisory Committee, Department of Health, Education, and Welfare.
W72-00374 5B

International Environmental Problems--A Taxonomy,
W72-00384 5C

PEAT
Thermodynamics and Composition of the Liquid Water Phase in Frozen Peat with Application to Infiltration Studies (K voprosu o faxovom sostave vody i teplofizicheskikh kharakteristikakh merzlogo torfa pri izuchenii infil' tratsii),
W72-00327 2F

PENNSYLVANIA
Pennsylvania (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00507 6E

PERCOLATION
Methods of Calculating Melt-water Percolation (Sposoby rascheta prosachivaniya talykh vod),
W72-00068 2G

PERIGLACIAL MORPHOLOGY
Periglacial Morphometry,
W72-00111 2C

PERMAFROST
Periglacial Morphometry,
W72-00111 2C

Study of Ice-Lens Formation Patterns (Issledovaniye zakonomernostey formirovaniya naledey),
W72-00323 2F

PERMEABILITY
Estimating Soil Permeability Rates,
W72-00345 2G

PERMITS
Hall-Jones Oil Co. v Corporation Commission (Denial of Permit to Dispose of Saline Water).
W72-00006 6E

Permits for New Outlets and Disposal Systems.
W72-00189 5G

Air and Water Pollution Control--Permits.
W72-00202 6E

Oil Spill.
W72-00217 6E

A Bill to Amend the Fish and Wildlife Coordination Act in Order to Protect Marine Environment by Regulating the Dumping of Wastes in the Coastal and Ocean Waters of the United States.
W72-00292 6E

State Certification of Activities Requiring Federal License or Permit.
W72-00293 6E

Permits to Dredge or Fill in or About Estuarine Waters or State Owned Lakes.
W72-00296 6E

PESTICIDE KINETICS
Influence of Several Species of Aquatic Plants on Dichlobenil Residues in Water,
W72-00137 5C

PESTICIDE REMOVAL
Influence of Several Species of Aquatic Plants on Dichlobenil Residues in Water,
W72-00137 5C

PESTICIDES
Effects on Freshwater Microfauna,
W72-00152 5C

PHOSPHATES
Phosphate Removal by Activated Sludge,
W72-00008 5D

An Act to Ban High Phosphate Detergents.
W72-00244 6E

Anaerobic Digestion of Sludges Containing Iron Phosphates,

W72-00414 5D

Phosphate Removal by pH Controlled Lime Dosage,
W72-00415 5D

PHOSPHORUS
Kinetic and Stoichiometric Limitations of Phosphate in Pure and Mixed Bacterial Cultures,
W72-00440 5C

PHOTONS
Effects of Radiation on Textile Wastes and Starch Solutions,
W72-00410 5D

PHOTOSYNTHESIS
Effects of Zooplankton on Algae in Westhampton Lake,
W72-00150 5C

Eco-Physiological Studies on Plants in Arid and Semi-Arid Regions in Western Australia. III. Comparative Studies of Photosynthesis, Respiration and Water Relations of Ten Arid Zone Plants Under Winter and Late Summer Climatic Conditions,
W72-00176 2I

Disinfection of Algal Laden Waters,
W72-00411 5D

PHYSICOCHEMICAL PROPERTIES
Light Scattering and Ultrasonic Investigations of Relaxation in Aqueous Solutions,
W72-00378 1A

PHYSIOLOGICAL ECOLOGY
Osmotic Water Stress: Mesophyll Saturation Deficit and Transpiration Rates of Tamarisk,
W72-00172 2D

Eco-Physiological Studies on Plants in Arid and Semi-Arid Regions in Western Australia. III. Comparative Studies of Photosynthesis, Respiration and Water Relations of Ten Arid Zone Plants Under Winter and Late Summer Climatic Conditions,
W72-00176 2I

Some Aspects of Water Balance in Tenebrionid Beetles and a Thysanuran From the Namib Desert of Southern Africa,
W72-00184 2I

PIEDMONT SOILS
Distribution of Moisture in the Unsaturated Profile on a Piedmont Watershed,
W72-00308 2G

PIEDMONT SOILS (SC)
Measurement of Interflow and Deep Seepage on Piedmont Watersheds,
W72-00311 2G

PILOT PLANTS
DESIGN OF A TREATMENT PLANT FOR BAKERY WASTES,
W72-00021 5D

PIPELINES
Magnolia Pipeline Co V. State (Actions of a Third Party as Defense to Pollution Prosecution).
W72-00160 6E

Scurlock Oil Co. V. Harrell (Action for Damages to Land and Water from Oil Pipeline Leakage).
W72-00353 6E

PIPES
Mid-Continent Pipeline Co v Crauthers (Release of Servant Tortfeasor).
W72-00413 6E

PLANKTON
The Use of Radioactive Carbon Method in Studies of Trophic Relationships of Plankton (Primenenie radiouglerodnogo metoda dlya isucheniya troficheskikh vzaimootnoshenii v planktone),
W72-00161 5C

PLANNING
Water Supply for the Future in Southern Nevada.
W72-00181 6D

Appraisal and Management of Water Resources in South Africa,
W72-00186 6B

A Bill to Amend the Federal Pollution Control Act, as Amended.
W72-00242 6E

Rules and Regulations for the Development, Submission and Adoption of Water Pollution Control and Abatement Plans for Sewage Drainage Basins.
W72-00284 5G

Satisfying Water Needs in Southern California,
W72-00340 6D

Evaluation of Natural River Environments: Phase II,
W72-00357 6B

Applications of Program Budgeting to Environmental Problems,
W72-00391 6B

A Return to the Coast,
W72-00393 2L

Nourishing Public Participation,
W72-00394 6B

The Evolution of a Funding Policy,
W72-00395 6B

Man and His Changing Environment,
W72-00405 5G

Water-Economics and Politics,
W72-00407 6B

Evaluation Strategies and Water Resource Development,
W72-00429 6B

PLANNING-PROGRAMMING-BUDGETING (PPB)
Applications of Program Budgeting to Environmental Problems,
W72-00391 6B

PLANT PHYSIOLOGY
Influence of Several Species of Aquatic Plants on Dichlobenil Residues in Water,
W72-00137 5C

PLASTIC DEFORMATION
Flexure of a Floating Ice Tongue,
W72-00330 2C

PLUG FLOW
Problems in Obtaining Adequate Sewage Disinfection,
W72-00419 5D

POISONS
Hazards of Mercury, Special Report to the Secretary's Pesticide Advisory Committee, Department of Health, Education, and Welfare.
W72-00374 5B

POLICY MAKING
Environmental Policy and Management,
W72-00390 6B

Man and His Changing Environment,
W72-00405 5G

Water-Economics and Politics,
W72-00407 6B

POLITICAL ASPECTS
Attitudes, Assessments, and Action,
W72-00013 5G

Patterns of Politics in Water Resources Development,
W72-00075 6E

The Water Pollution Control Agency: Legas Basis, Administration Regulations And Staffing,
W72-00221 5G

International Developments In Water Pollution Control: Principles Of Responsibility: Continental Europe,
W72-00234 5G

The 1969 Brussels Convention On Civil Liability For Oil Pollution,
W72-00238 5G

Private Action Under the Public Trust: An Environmental Bill of Rights for California,
W72-00272 5G

Multi-Media Confrontation--The Environmentalist's Strategy for a 'No-Win' Agency Proceeding,
W72-00286 5G

POLITICAL SCIENCE
Patterns of Politics in Water Resources Development,
W72-00075 6E

POLITICS
Water-Economics and Politics,
W72-00407 6B

POLLUTANT IDENTIFICATION
Characteristics of Evaporation from Industrial Wastes (Osobennosti ispareniya s promyshlennykh stokov),
W72-00063 5B

North v. Evans (Damage to Land from Salt Water Discharged from Oil Wells).
W72-00466 6E

POLLUTANTS
Public Perception of Environmental Quality in Tucson, Arizona,
W72-00174 5G

International Environmental Problems--A Taxonomy,
W72-00384 5C

POLLUTION ABATEMENT
Attitudes, Assessments, and Action,
W72-00013 5G

A New Process For Recovery of By-products From Shellfish Waste,

W72-00025 5D

Dispatching System for Control of Combined Sewer Losses,
W72-00080 5G

Pollution of Waters of State.
W72-00095 6E

Amenities Rights--Parallels to Pollution Taxes,
W72-00192 5G

Environmental Protection Act.
W72-00204 6E

Rules and Regulations Establishing Surface Water Quality Criteria.
W72-00219 5G

A Bill to Amend the Federal Pollution Control Act, as Amended.
W72-00242 6E

Great Lakes Pollution,
W72-00247 5G

Tanker Owners Voluntary Agreement Concerning Liability for Oil Pollution.
W72-00248 6E

Principles of Responsibility in International Law,
W72-00251 6E

Lawyers as Human Environmentalists Advocate's Environmental Advice,
W72-00252 6E

Suing the Polluter: Approaches to Achieve Standing,
W72-00256 5G

Licensing and Regulation of use of Oil Spill Cleanup Agents.
W72-00264 6E

The Challenge of Environmental Quality: An Outline of Remedies to Meet It,
W72-00270 5G

Private Action Under the Public Trust: An Environmental Bill of Rights for California,
W72-00272 5G

Thomas J. Anderson, Gordon Rockwell Environmental Protection Act of 1970.
W72-00277 6E

How we Got the Dirtiest Stream in America,
W72-00282 5G

New Jersey Water Quality Improvement Act of 1971.
W72-00298 6E

North Carolina Pollution Abatement and Industrial Facilities Financing Act.
W72-00304 6E

Farmers Chemical Ass'n v. Union Camp Co. (Denial of Jury Trial When Injunction Sought to Abate Pollution).
W72-00343 6E

International Environmental Problems--A Taxonomy,
W72-00384 5C

People V. City of Los Angeles (Municipal Sewage Disposal Regulation by the State Department of Health).
W72-00398 6E

Annual Progress Report 1969-1970.
W72-00451 5G

Landowner's Right to Relief Against Pollution of His Water Supply by Industrial or Commercial Waste,
W72-00452 6E

Pollution Problems in the Petroleum Industry--Construction of and Compliance with Federal and State Laws,
W72-00455 5G

Controlling Pollution: The Economics of a Cleaner America,
W72-00459 5G

The Annual Report of the Council of Economic Advisors, 1966.
W72-00467 5G

Transcripts of the Speeches, National Conference on Environmental Law.
W72-00468 6E

The Legal Future: New Theories of Environmental Protection,
W72-00469 6E

Alabama (Analysis and Comparison with Tennessee Water Pollution Control Law),
W72-00477 6E

California (Analysis and Comparison with Tennessee Water Pollution Law),
W72-00481 6E

Indiana (Analysis and Comparison with Tennessee Water Pollution Law),
W72-00485 6E

Louisiana (Analysis of State's Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00489 6E

Maine (Analysis of State's Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00490 6E

Maryland (Analysis of Maryland Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00491 6E

Nevada (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00498 6E

New York (Analysis of State's Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00502 6E

North Dakota (Analysis of State's Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00503 6E

Oregon (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00506 6E

POLLUTION CONCENTRATIONS
Evaluation of Dispersed Pollutional Loads from Urban Areas,
W72-00355 5B

POLLUTION LOADS
Evaluation of Dispersed Pollutional Loads from Urban Areas,
W72-00355 5B

POLYMERIZATION
Development of Immobilized Enzyme Systems for Enhancement of Biological Waste Treatment Processes,
W72-00002 5D

POMPANO
Toxicity of Certain Chemicals to Juvenile Pompano,
W72-00143 5C

PONTIAC (MICH)
A Field Study of Inorganic Nitrogen Oxidation Rates,
W72-00018 5B

POPULATION DISPERSION
Interbasin Transfers: Do We Need Them,
W72-00402 6D

POPULATION GROWTH
Satisfying Water Needs in Southern California,
W72-00340 6D

PORES
Nature and Extent of Macropores in Forest Soils and Their Influence on Subsurface water Movement,
W72-00313 2G

POROUS MEDIA
Ditch Drainage of Anisotropic Nonhomogeneous Porous Media: A Model Study,
W72-00309 2G

POST-IMPOUNDMENT
Chemical and Biological Conditions in Bald Eagle Creek and Prognosis of Trophic Characteristics of Foster Joseph Sayers Reservoir, Centre County, Pennsylvania,
W72-00129 5C

POTASSIUM COMPOUNDS
Toxicity of Certain Chemicals to Juvenile Pompano,
W72-00143 5C

POULTRY
BOD From Poultry Processing Plants,
W72-00444 5D

Discussion of 'BOD From Poultry Processing Plants',
W72-00445 5D

PRECIPITATION (ATMOSPHERIC)
Experimental Hydrologic Investigations at Valday (Eksperimental'nyye gidrologicheskiye issledovaniya na Valdaye).
W72-00061 2B

Effect of Precipitation and Evaporation on Changes in Solution Concentration (Vliyaniye dozhdey i ispareniya na izmeneniye kontsentratsii rastvorov),
W72-00064 5B

Estimation of Intercepted Solid Precipitation and Determination of Evaporation from a Spruce Forest during a Winter Period (Otsenka velichiny zaderzhaniya tverdykh osadkov i opredeleniye ispareniya s yelovogo lesa v zimniy period),

W72-00065 2B

Accurate Measurement of Atmospheric Precipitation by the Tret'yakov Precipitation Gage (O korrektnom izmerenii atmosfernykh osadkov osadkomerom Tret'yakova),
W72-00066 2B

Estimation of Groundwater Recharge by Atmospheric Precipitation with Few or no Observations of the Groundwater Regime (Metod otsenki pitaniya gruntovykh vod atmosfernymi osadkami pri nedostatochnosti ili otsutstvii nablyudeniy za rezhimom gruntovykh vod),
W72-00324 2F

PRECIPITATION GAGES
Accurate Measurement of Atmospheric Precipitation by the Tret'yakov Precipitation Gage (O korrektnom izmerenii atmosfernykh osadkov osadkomerom Tret'yakova),
W72-00066 2B

PRESERVATION
Stream Preservation in Arkansas.
W72-00190 2E

PRESSURE
Pressures Inside Freezing Water Drops,
W72-00088 2C

PRESSURE DISTRIBUTION
Pressure Distribution on a Center-pivot Sprinkler Irrigation System,
W72-00078 8B

PRESSURE HEAD
Effect of Temperature on Pressure Head-water Content Relationship and Conductivity of Two Soils,
W72-00312 2G

PRIMARY SLUDGE
Anaerobic Digestion of Sludges Containing Iron Phosphates,
W72-00414 5D

PRODUCTIVITY
The Fishery Potential of Four Aquatic Environments Created by Interstate Route 91 Construction in Massachusetts,
W72-00135 4C

Nitrogen Cycle and Primary Production in Mesotrophic Lake Lucerne (Horwer Bay) and in Eutrophic Red Lake with Special Regard to Nitrates as Limiting Factors (Stickstoff-Kreislauf und Primaproduktion im Mesotrophen Vier-Waldstattrsee (Horwer Bucht) und im Eutrophen Rotsee, mit Besonderer Berucksichtigung des Nitrats als Limitierenden Faktors),
W72-00158 5C

Varied Responses to India's Agricultural Strategy,
W72-00173 3F

PROGRAM BUDGETING
Applications of Program Budgeting to Environmental Problems,
W72-00391 6B

PROGRAM REFORM
The Evolution of a Funding Policy,
W72-00395 6B

PROJECT PLANNING
International Developments In Water Pollution Control: Principles Of Responsibility: Continental Europe,
W72-00234 5G

Environmental Considerations in Department of Defense Actions.
W72-00295 6E

Arizona (Analysis and Comparison with Tennessee Water Pollution Control Law),
W72-00479 6E

PROTECTION (ELECTRICAL)
Hvdc transmission Control Schemes.
W72-00342 8C

PROVENANCE
Gibbsite in Coastal Plain Soils, Southeastern United States,
W72-00090 2G

Exotic Pebbles in Quaternary Deposits from the South Coast of the St. Lawrence Estuary, Quebec,
W72-00134 2L

PUBLIC GOODS
The Valuation of Public Goods,
W72-00392 6B

PUBLIC HEALTH
General Studies on Trematodes in Thailand: Classification of Cercariae in Thailand,
W72-00138 5C

The Water Pollution Control Agency: Legas Basis, Administration Regulations And Staffing,
W72-00221 5G

The Metabolism of Cities,
W72-00403 6B

Values in the Control of Environment,
W72-00404 5G

Man and His Changing Environment,
W72-00405 5G

PUBLIC INVESTMENT
The Valuation of Public Goods,
W72-00392 6B

PUBLIC LANDS
Classification of Public Lands Valuable for Geothermal Steam and Associated Geothermal Resources,
W72-00096 2F

PUBLIC PARTICIPATION
Nourishing Public Participation,
W72-00394 6B

PUBLIC RIGHTS
Amenities Rights--Parallels to Pollution Taxes,
W72-00192 5G

Radioactive Waste and the Environment,
W72-00193 5B

Waters--Tidal Waters--Power of Legislature to Authorize Pollution of Fisheries.
W72-00215 5G

Suing the Polluter: Approaches to Achieve Standing,
W72-00256 5G

Private Action Under the Public Trust: An Environmental Bill of Rights for California,
W72-00272 5G

Thomas J. Anderson, Gordon Rockwell Environmental Protection Act of 1970.
W72-00277 6E

PUBLIC TRUST DOCTRINE
Waters--Tidal Waters--Power of Legislature to Authorize Pollution of Fisheries.
W72-00215 5G

The Challenge of Environmental Quality: An Outline of Remedies to Meet It,
W72-00270 5G

Private Action Under the Public Trust: An Environmental Bill of Rights for California,
W72-00272 5G

PUBLICATIONS
Notes on Sedimentation Activities, Calender Year 1970.
W72-00318 2J

PULP AND PAPER INDUSTRY
New Applications of On-stream Analysers in Pulp Mills,
W72-00009 5A

PULP WASTES
New Applications of On-stream Analysers in Pulp Mills,
W72-00009 5A

Pulp-mill Waste-water Discharges into Puget Sound: An Industry Viewpoint,
W72-00258 5G

PYRITE
The Effects of Various Atmospheres on the Oxidation of Coal Mine Pyrites,
W72-00081 5G

PYROLYSIS
Preliminary Design And Development Of The Intermediate Water Recovery System, (Volume I).
W72-00046 5D

QUALITY CONTROL
Optimum Sample Sizes for Concrete Cylinder Tests Using Information Theory,
W72-00076 8F

QUANTIFICATION
Effects of Reservoir Operating Policy on Recreation Benefits,
W72-00399 4A

QUATERNARY PERIOD
The Quaternary Deltaic and Channel System in the Central Great Valley, California,
W72-00177 2J

QUI TAM ACTIONS
United States V Northwest Paper Co. (Standing to Bring Qui Tam Action under Refuse Act of 1899).
W72-00121 6E

Enquist V Quaker Oats Co. (Standing to Bring Qui Tam Action Under Refuse Act of 1899, and to Seek Injunction).
W72-00140 6E

RA
Atlantic Ocean Pollution and Biota Observed by the 'RA' Expeditions,
W72-00147 5C

RADIATION
Biological--Gamma-Radiation System for Sewage Processing,

W72-00383 5D

RADIOACTIVE WASTES
Radioactive Waste and the Environment,
W72-00193 5B

RADIOACTIVITY TECHNIQUES
The Use of Radioactive Carbon Method in Studies of Trophic Relationships of Plankton (Primenenie radiouglerodnogo metoda dlya isucheniya troficheskikh vzaimootnoshenii v planktone),
W72-00161 5C

RAIN GAGES
Accurate Measurement of Atmospheric Precipitation by the Tret'yakov Precipitation Gage (O korrektnom izmerenii atmosfernykh osadkov osadkomerom Tret'yakova),
W72-00066 2B

RAINFALL
Infiltration, Throughflow, And Overland Flow,
W72-00105 2G

Erosion by Water on Hillslopes,
W72-00106 2J

Summer Rainfall over the Santa Catalina Mountains,
W72-00168 2B

RAINFALL-RUNOFF RELATIONSHIPS
Annual Compilation and Analysis of Hydrologic Data for Elm Fork Trinity River, Trinity River Basin, Texas, 1969,
W72-00097 7C

Infiltration, Throughflow, And Overland Flow,
W72-00105 2G

Stochastic Difference Equation Modelling of Hydrologic Processes,
W72-00306 2A

Effect of Rainfall on the Resistance in Channels with Shallow Flow,
W72-00307 8B

Characteristics and Filtering of Noise in Linear Hydrologic Systems,
W72-00310 2A

Linear Systems Analysis in Hydrology--The Transform approach, the Kernel Oscillations and the Effect of Noise,
W72-00317 2A

RANGE MANAGEMENT
Range Ecology at the Institute,
W72-00166 3F

REACTION RATE COEFFICIENTS
Kinetic Aanalysis of Data from Biological Systems,
W72-00007 5D

REAERATION
Reaeration through Low Dams in the Ohio River,
W72-00032 5G

An Experimental Study of the Effect of Channel Surface Roughness on the Reaeration Rate Coefficient,
W72-00039 5G

REAL PROPERTY
Pure Oil v. Renton (Action for Damages to Realty from Pollution of Stream by Saline Water).
W72-00463 6E

RECLAMATION
Range Ecology at the Institute,
W72-00166 3F

RECREATION
Combined Wastewater Collection And Treatment Facility, Mount Clemens, Michigan,
W72-00042 5D

Oklahoma Copan Lake. Little Caney River, Flood Control, Water Qaulity, Water Supply, Fish and Wildlife and Recreation Lake Located in Washington, County.
W72-00348 6G

Effects of Reservoir Operating Policy on Recreation Benefits,
W72-00399 4A

RECREATION DEMAND
Effects of Reservoir Operating Policy on Recreation Benefits,
W72-00399 4A

RECREATION WASTES
Parks and Recreation--Sanitation.
W72-00288 5G

REGENERATION
Horizontal HCl Pickling Line at Fukuyama,
W72-00004 5D

Reduction of Salt Content of Food Processing Liquid Waste Effluent,
W72-00409 5D

REGIONAL TREATMENT
Use and Abuse of Natural Water Systems,
W72-00380 5D

REGRESSION ANALYSIS
Evaluation of Dispersed Pollutional Loads from Urban Areas,
W72-00355 5B

REGULATED FLOW
Acidity Control in Bald Eagle Creek and West Branch Susquehanna River, Clinton County, Pennsylvania.
W72-00128 5B

REGULATION
Rules and Regulations Establishing Minimum Standards Relating to Location, Design, Construction, and Maintenance of Individual Sewage Disposal Systems.
W72-00197 5E

Inability Of Traditional Forms Of Political Order To Adapt To Modern Problems Of International Pollution,
W72-00233 5G

Gulf Oil Corp. v. alexander (Pollution of Groundwater by Seepage from Salt Water Disposal Pits).
W72-00381 6E

Water Quality Criteria for Specified River Basins.
W72-00449 5G

Implementation and Enforcement Plan for Water Quality Regulations.
W72-00453 5G

Water Pollution Control Programs.
W72-00457 5G

Massachusetts (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00492 6E

Minnesota (Analysis of State's Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00494 6E

Montana (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00496 6E

New Mexico (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00501 6E

Vermont (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00512 6E

Federal Water Pollution Control Act,
W72-00518 6E

REGULATIONS
Utah (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00511 6E

REGULATOR
Dispatching System for Control of Combined Sewer Losses,
W72-00080 5G

RELAXATION PHENOMENA
Light Scattering and Ultrasonic Investigations of Relaxation in Aqueous Solutions,
W72-00378 1A

REMEDIES
Possible Liabilities Arising from Violations of Conservation Orders,
W72-00220 6E

Liability In National And International Law For Damage Through Water Pollution,
W72-00224 5G

Suing the Polluter: Approaches to Achieve Standing,
W72-00256 5G

Tort Liability and the Oil and Gas Industry,
W72-00257 5G

The Challenge of Environmental Quality: An Outline of Remedies to Meet It,
W72-00270 5G

Gulf Oil Corp. v. alexander (Pollution of Groundwater by Seepage from Salt Water Disposal Pits).
W72-00381 6E

Landowner's Right to Relief Against Pollution of His Water Supply by Industrial or Commercial Waste,
W72-00452 6E

Wood Oil Co. v. Vendicott (Damage to Realty and Personalty from Oil Wells).
W72-00465 6E

The Legal Future: New Theories of Environmental Protection,

W72-00469 6E

REMOTE CONTROL
Water Resource Pollutant Identification by Digital Computer Analysis of Remote Infrared Sensor Spectral Intensities,
W72-00305 5A

REMOVAL
Phosphate Removal by pH Controlled Lime Dosage,
W72-00415 5D

RESERVOIR OPERATION
Mechanics of Flow from Stratified Reservoirs in the Interest of Water Quality: Hydraulic Laboratory Investigation,
W72-00361 5F

Effects of Reservoir Operating Policy on Recreation Benefits,
W72-00399 4A

RESERVOIRS
Dams And Ecology--Can They Be Made Compatible,
W72-00116 8A

Chemical and Biological Conditions in Bald Eagle Creek and Prognosis of Trophic Characteristics of Foster Joseph Sayers Reservoir, Centre County, Pennsylvania,
W72-00129 5C

Effects of Reservoir Operating Policy on Recreation Benefits,
W72-00399 4A

RESOURCE DEVELOPMENT
Geothermal Exploration,
W72-00077 2F

RESPIROMETERS
A Critical Review of BOD Analysis Using Respirometer Techniques,
W72-00036 5A

REVIEWS
The Drainage Basin As The Fundamental Geomorphic Unit,
W72-00102 2J

Eutrophication,
W72-00165 5C

Notes on Sedimentation Activities, Calender Year 1970.
W72-00318 2J

Ocean Outfall Design: Part I - Literature Review and Theoretical Development,
W72-00356 5B

RHEOLOGY
The Dynamics of Temperature Glaciers from the Detailed Viewpoint,
W72-00087 2C

RHODE ISLAND
Rules and Regulations Establishing Minimum Standards Relating to Location, Design, Construction, and Maintenance of Individual Sewage Disposal Systems.
W72-00197 5E

Rhode Island (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00508 6E

RIPARIAN RIGHTS
Pakistan's Water Problems and the Law of International Rivers,
W72-00179 6E

RIPPLE MARKS
Sand Waves on Browns Bank Observed from the Shelf Diver,
W72-00130 2J

RIVER BASIN DEVELOPMENT
International Law and Pollution of International Rivers and Lakes,
W72-00280 5G

RIVER BASINS
Computer Simulation of the Hydrologic-Salinity Flow System within the Upper Colorado River Basin,
W72-00084 7C

The Drainage Basin As The Fundamental Geomorphic Unit,
W72-00102 2J

Pakistan's Water Problems and the Law of International Rivers,
W72-00179 6E

Regulations Concerning Treatment of Wastewaters, Domestic and Industrial, Separately or in Combination, Discharged into the Waters of the Hackensack River.
W72-00206 5D

Regulations Concerning Treatment of Wastewaters, Domestic and Industrial, Separately or in Combination, Discharged into the Waters of the Wallkill River Basin.
W72-00209 5D

Regulations Concerning Treatment of Wastewaters, Domestic and Industrial, Separately or in Combination, Discharged into the Waters of the Passaic River Including the Newark Bay.
W72-00210 5D

RIVER FLOW
Role of Artesian Water in the Formation of Streamflow as Illustrated by the Tosna River (Otsenka roli napornykh podzemnykh vod v formirovanii rechnogo stoka na primere r. Tosny),
W72-00321 2F

Study of Ice-Lens Formation Patterns (Issledovaniye zakonomernostey formirovaniya naledey),
W72-00323 2F

Perennial Fluctuations of Minimum Streamflow in the European USSR During a Winter Period (Nekotoryye zakonomernosti mnogoletnikh kolebaniy minimal'nogo stoka rek ETS v zimniy period),
W72-00328 2F

Jones Bluff Lock and Dam, Alabama River Navigation Project: Hydraulic Model Investigation,
W72-00359 8B

RIVER SYSTEMS
An Experimental Study of the Effect of Channel Surface Roughness on the Reaeration Rate Coefficient,
W72-00039 5G

RIVERS
Spring Breakup of the Delta River, Alaska,
W72-00094 2C

Open Channel Flow,
W72-00108 8B

Water Quality Standards (Interstate Waters, Illinois River and Lower Section of Des Plaines River),
W72-00195 6E

Surface and Subsurface Flow into Rivers of the West Siberian Plain (Poverkhnostnyy i podzemnyy pritok v reki Zapadno-Sibirskoy ravniny),
W72-00326 2F

Jones Bluff Lock and Dam, Alabama River Navigation Project: Hydraulic Model Investigation,
W72-00359 8B

Navigation Conditions in Fort Smith Reach, Arkansas River. Hydraulic Model Investigation,
W72-00360 8B

Navigation Conditions at Lock and Dam No. 7, Arkansas River: Hydraulic Model Investigation,
W72-00365 8B

River Pollution in International Law,
W72-00450 5G

RIVERS AND HARBORS ACT
United States V Northwest Paper Co. (Standing to Bring Qui Tam Action under Refuse Act of 1899).
W72-00121 6E

Enquist V Quaker Oats Co. (Standing to Bring Qui Tam Action Under Refuse Act of 1899, and to Seek Injunction).
W72-00140 6E

The Use of the Corps of Engineers Permit Authority as a Tool for Defending the Environment,
W72-00253 5G

ROCK MECHANICS
Study of Natural Stress Distribution in Rock Massifs with the Help of Seismic-acoustic methods,
W72-00079 8E

An Automated Test Facility for Rock Mechanics Research,
W72-00344 8E

ROCK PROPERTIES
Study of Natural Stress Distribution in Rock Massifs with the Help of Seismic-acoustic methods,
W72-00079 8E

ROCKS
The Role Of Water In Rock Disintegration,
W72-00103 2J

ROOT SYSTEMS
Model for Iso-Osmotic Water Flow in Plant Roots,
W72-00178 2I

ROTATING BIOLOGICAL SURFACE
Systemation in Using the Rotating Biological Surface (RBS) Waste Treatment Process,
W72-00435 5D

ROTENONE
Effects on Freshwater Microfauna,

W72-00152 5C

ROTSEE (SWITZERLAND)
Nitrogen Cycle and Primary Production in Mesotrophic Lake Lucerne (Horwer Bay) and in Eutrophic Red Lake with Special Regard to Nitrates as Limiting Factors (Stickstoff-Kreislauf und Primaproduktion im Mesotrophen Vier-Waldstattrsee (Horwer Bucht) und im Eutrophen Rotsee, mit Besonderer Berucksichtigung des Nitrats als Limitierenden Faktors),
W72-00158 5C

RUNOFF
Relation Of Morphometry To Runoff Frequency,
W72-00112 2E

Geomorphic Implications of Climatic Changes,
W72-00114 2E

How Does Forest-Range Conversion in Ozark Uplands Affect Runoff,
W72-00164 4A

The Freshwater-Supply Problems of Mankind,
W72-00187 2A

Perennial Fluctuations of Minimum Streamflow in the European USSR During a Winter Period (Nekotoryye zakonomernosti mnogoletnikh kolebaniy minimal'nogo stoka rek ETS v zimniy period),
W72-00328 2F

RURAL AREAS
Rural Water And Sanitation Facilities.
W72-00227 6E

Loans to Rural Areas for Water Supply and Sewage Disposal Systems.
W72-00260 5G

SAFETY
Model Law to Improve Dam Safety,
W72-00073 6E

SALINE SOILS
A Model for the Economic Evaluation of Water Quality in Irrigation,
W72-00382 3F

SALINE WATER
Pickens V. Harrison (Damages to Irrigation Well Caused by Salt Water Pollution from Oil Well).
W72-00214 6E

General Crude Oil Co. V. Aiken (Groundwater Pollution by Saline Water from Oil Drilling Operations as Creating Permanent Damages).
W72-00363 5G

Gulf Oil Corp. v. alexander (Pollution of Groundwater by Seepage from Salt Water Disposal Pits).
W72-00381 6E

Pure Oil v. Renton (Action for Damages to Realty from Pollution of Stream by Saline Water).
W72-00463 6E

North v. Evans (Damage to Land from Salt Water Discharged from Oil Wells).
W72-00466 6E

Magnolia Petroleum Co. V. McGeeley (Payment for Void Easements as Offset to Recovery for Pollution Damages).
W72-00543 6E

SALINE WATER INTRUSION
Peterson V. Texas Co. (Liability for Damages Caused by Escape Wastes from Oil Lease),
W72-00458 6E

SALINITY
Computer Simulation of the Hydrologic-Salinity Flow System within the Upper Colorado River Basin,
W72-00084 7C

Osmotic Water Stress: Mesophyll Saturation Deficit and Transpiration Rates of Tamarisk,
W72-00172 2D

Thompson V. Walsh (Injury to Cattle Resulting From Stream Pollution by Oil Lessee).
W72-00400 6E

SALMON
Interference With Streams and Waters; Protection of Fish and Game.
W72-00261 6E

SALT EXTRACTION
Study of Unconventional Methods for Brine Concentration,
W72-00379 3A

SALT GLANDS
Osmotic Water Stress: Mesophyll Saturation Deficit and Transpiration Rates of Tamarisk,
W72-00172 2D

SALT TOLERANCE
A Model for the Economic Evaluation of Water Quality in Irrigation,
W72-00382 3F

SAMPLING
Effect of Precipitation and Evaporation on Changes in Solution Concentration (Vliyaniye dozhdey i ispareniya na izmeneniye kontsentratsii rastvorov),
W72-00064 5B

Improved Discrete Depth Sampler,
W72-00093 7B

An Automatic Runoff Sampler,
W72-00118 7B

Sedimentological Sampling and Results from the Diver Lock-out Facility of the Submersible Shelf Diver, Bay of Fundy, Nova Scotia,
W72-00131 2L

Exotic Pebbles in Quaternary Deposits from the South Coast of the St. Lawrence Estuary, Quebec,
W72-00134 2L

The Importance of Avoiding Chemical Contamination for a Successful Cultivation of Marine Organisms,
W72-00149 5C

New England Interstate Water Pollution Control Commission.
W72-00287 5G

New York's Water Quality Surveillance Program,
W72-00424 5G

SAN FRANCISCO BAY-DELTA SYSTEM
Chlorinated Hydrocarbons: Emerging Implications in Regional Planning,
W72-00038 5B

SAND WAVES
Sand Waves on Browns Bank Observed from the Shelf Diver,
W72-00130 2J

SANTA MONICA BAY
Operational and Maintenance Experience In Screening Digested Sludge,
W72-00044 5D

SCLEROPHYLLIC PLANTS
Eco-Physiological Studies on Plants in Arid and Semi-Arid Regions in Western Australia. III. Comparative Studies of Photosynthesis, Respiration and Water Relations of Ten Arid Zone Plants Under Winter and Late Summer Climatic Conditions,
W72-00176 2I

SCOTIAN SHELF
Sand Waves on Browns Bank Observed from the Shelf Diver,
W72-00130 2J

SCOUR
The Geomorphology And Morphometry Of Glacial And Nival Areas,
W72-00110 2C

SCREENS
Operational and Maintenance Experience In Screening Digested Sludge,
W72-00044 5D

SEA ICE
Albedo and Degree of Puddling of a Melting Cover of Sea Ice,
W72-00331 2C

SEA LEVEL
The Quaternary Deltaic and Channel System in the Central Great Valley, California,
W72-00177 2J

SEDIMENT COATING
A Method of Tracing Sediment Movement on the Texas Gulf Coast,
W72-00314 2J

SEDIMENT DISCHARGE
Study of the Geometry of Sand Dunes and Estimation of Bottom Sediment Discharge (Issledovaniye geometricheskikh kharakteristik peschanykh gryad i otsenka raskhoda donnykh nanosov),
W72-00069 2J

SEDIMENT TRANSPORT
Study of the Geometry of Sand Dunes and Estimation of Bottom Sediment Discharge (Issledovaniye geometricheskikh kharakteristik peschanykh gryad i otsenka raskhoda donnykh nanosov),
W72-00069 2J

World Erosion and Sedimentation,
W72-00101 2J

Soil Moisture,
W72-00104 2G

Erosion by Water on Hillslopes,
W72-00106 2J

Open Channel Flow,
W72-00108 8B

Hydraulic Geometry,

W72-00109 8B

Streamflow, Sediment-Transport, And Water-Temperature Characteristics Of Three Small Watersheds In The Alsea River Basin, Oregon,
W72-00115 2E

Sand Waves on Browns Bank Observed from the Shelf Diver,
W72-00130 2J

Exotic Pebbles in Quaternary Deposits from the South Coast of the St. Lawrence Estuary, Quebec,
W72-00134 2L

A Method of Tracing Sediment Movement on the Texas Gulf Coast,
W72-00314 2J

SEDIMENT YIELD
World Erosion and Sedimentation,
W72-00101 2J

SEDIMENTATION
The Bristol Fall Column for Coarse Sediment Grading,
W72-00057 2J

Introduction to Fluvial Processes.
W72-00100 2J

World Erosion and Sedimentation,
W72-00101 2J

The Role Of Water In Rock Disintegration,
W72-00103 2J

Notes on Sedimentation Activities, Calender Year 1970.
W72-00318 2J

SEDIMENTATION ACTIVITIES (1971)
Notes on Sedimentation Activities, Calender Year 1970.
W72-00318 2J

SEDIMENTS
Precise Sediment Density Determination by Gamma-Ray Attenuation Alone,
W72-00059 2J

SEEPAGE
Ditch Drainage of Anisotropic Nonhomogeneous Porous Media: A Model Study,
W72-00309 2G

Estimating Soil Permeability Rates,
W72-00345 2G

SELECTIVE ION ELECTRODE METHOD
Determination of Sodium in Black Liquor Using a Selective Ion Electrode,
W72-00416 5D

SELENIUM
Toxicity of Selenium to the Blue-Green Algae, Anacystis Nidulans and Anabaena Variabilis,
W72-00153 5C

SELF-PURIFICATION
Interpretation of Results from the Studies of Pollution of Surface Flowing Waters,
W72-00125 5A

Impact of Stream Assimilation Capacity on Waste Treatment Requirements,
W72-00432 5C

SEMIARID CLIMATE
Some Aspects of Resource Use in Relation to the Orange River Project,
W72-00185 3F

SEMIARID CLIMATES
The Geomorphology of Central Australia, (Geomorphologie von Zentralaustralien Nach H. Bremer),
W72-00170 2J

SENSITIVITY
Method of a New Differential Thermal Analysis,
W72-00030 5A

SEPARATION TECHNIQUES
Studies of Municipal Wastewater Renovation For Industrial Water,
W72-00045 5D

SEPTIC TANKS
Investigation of Techniques to Provide Advance Warning of Ground-water Pollution Hazards with Special Reference to Aquifers in Glacial Outwash,
W72-00358 5B

SETTLING VELOCITY
The Bristol Fall Column for Coarse Sediment Grading,
W72-00057 2J

SEWAGE DISPOSAL
City of Bethany V. Municipal Securities Co. (Appealing Party Limited to Defenses Raised at Trial).
W72-00167 6E

Rules and Regulations Establishing Minimum Standards Relating to Location, Design, Construction, and Maintenance of Individual Sewage Disposal Systems.
W72-00197 5E

Loans to Rural Areas for Water Supply and Sewage Disposal Systems.
W72-00260 5G

Sewage Disposal.
W72-00265 6E

Rules and Regulations for the Development, Submission and Adoption of Water Pollution Control and Abatement Plans for Sewage Drainage Basins.
W72-00284 5G

Water Dist. No. 105, King County V State (Approval and Certification for Sewer System Construction).
W72-00333 6E

People V. City of Los Angeles (Municipal Sewage Disposal Regulation by the State Department of Health).
W72-00398 6E

City of Bethany v. Twin Lakes Gun Club (Measuring Damages to Plaintiff's Lake from Pollution from City Sewage Disposal Plant).
W72-00461 6E

Kinnischtzke V. City of Glen Ullin (Liability of Municipality Discharging Inadequately Treated Sewage).
W72-00544 6E

SEWAGE EFFLUENTS
Biological--Gamma-Radiation System for Sewage Processing,
W72-00383 5D

SEWAGE TREATMENT
Sewage Disposal.
W72-00265 6E

Biological--Gamma-Radiation System for Sewage Processing,
W72-00383 5D

SEWERS
Dispatching System for Control of Combined Sewer Losses,
W72-00080 5G

Sewer Construction.
W72-00291 6E

SHALLOW CHANNEL FLOW
Effect of Rainfall on the Resistance in Channels with Shallow Flow,
W72-00307 8B

SHELLFISH SANITATION
General Studies on Trematodes in Thailand: Classification of Cercariae in Thailand,
W72-00138 5C

SHELLFISH WASTES
A New Process For Recovery of By-products From Shellfish Waste,
W72-00025 5D

SHIPS
United Kingdom: Oil in Navigable Waters Act of 1971.
W72-00213 6E

Oil Spill.
W72-00217 6E

Inter-Governmental Maritime Consultative Organization: Draft Convention On Civil Liability For Pollution Damage.
W72-00228 6E

Inter-Governmental Maritime Consultative Organization: Draft Convention On Rights Of Coastal States To Intervene In Casualties On The High Seas Causing Oil Pollution.
W72-00229 6E

International Convention For The Prevention Of Pollution Of The Sea By Oil, 1954 (As Amended).
W72-00230 6E

The 1969 Brussels Convention On Civil Liability For Oil Pollution,
W72-00238 5G

An Act Concerning the Insurance or Bonding of Oil Companies and Carriers.
W72-00245 6E

Tanker Owners Voluntary Agreement Concerning Liability for Oil Pollution.
W72-00248 6E

Oil Upon the Waters,
W72-00289 5G

Terminals for the Loading or Discharge of Petroleum or Chemical Liquids or Products from Vessels.
W72-00299 5G

SILTS
City of Bethany V. Municipal Securities Co. (Appealing Party Limited to Defenses Raised at Trial).
W72-00167 6E

SIMPSON DESERT
Vegetation Studies in the Simpson Desert, N.T.,

SIMPSON DESERT

W72-00182 2I

SITES
Power for Tomorrow: The Siting Dilemma,
W72-00269 5G

SLOPES
Erosion by Water on Hillslopes,
W72-00106 2J

SLUDGE DIGESTION
Nomograph Solution of Heat Requirements for Digesters.
W72-00417 5D

SLUDGE DISPOSAL
Operational and Maintenance Experience In Screening Digested Sludge,
W72-00044 5D

The Copeland Process Fluid Bed System and Pollution Control World Wide,
W72-00447 5D

SLUDGE TREATMENT
Chemical Conditioning of Biological Sludges for Vacuum Filtration,
W72-00037 5D

SMALL WATERSHEDS
Annual Compilation and Analysis of Hydrologic Data for Elm Fork Trinity River, Trinity River Basin, Texas, 1969,
W72-00097 7C

Streamflow, Sediment-Transport, And Water-Temperature Characteristics Of Three Small Watersheds In The Alsea River Basin, Oregon,
W72-00115 2E

Effect of Rainfall on the Resistance in Channels with Shallow Flow,
W72-00307 8B

SNAILS
Effects of Copper on Gammarus Pseudolimnaeus, Physa Integra, and Campeloma Decisum in Soft Water,
W72-00148 5C

SNOW
Estimation of Intercepted Solid Precipitation and Determination of Evaporation from a Spruce Forest during a Winter Period (Otsenka velichiny zaderzhaniya tverdykh osadkov i opredeleniye ispareniya s yelovogo lesa v zimniy period),
W72-00065 2B

The Growth of Bonds and the Increase of Mechanical Strength in a Dry Seasonal Snow-Pack,
W72-00334 2C

SNOWPACKS
The Growth of Bonds and the Increase of Mechanical Strength in a Dry Seasonal Snow-Pack,
W72-00334 2C

SOCIAL ASPECTS
Attitudes, Assessments, and Action,
W72-00013 5G

SOCIAL BENEFIT/SOCIAL COST
Environmental Policy and Management,
W72-00390 6B

SOCIAL VALUES
Public Perception of Environmental Quality in Tucson, Arizona,
W72-00174 5G

Lawyers as Human Environmentalists Advocate's Environmental Advice,
W72-00252 6E

SOCIO-ECONOMIC VALUES
A Return to the Coast,
W72-00393 2L

SODA PULPING PROCESS
Zimpro Wet Oxidation of Soda Pulping Liquors,
W72-00032 5D

SOIL CONTAMINATION
Ross V. Fink (Statute Prohibiting Salt Water Flow Over Surface of Land Inapplicable to Pollution by Underground Waters).
W72-00387 6E

SOIL CONTAMINATION EFFECTS
Scurlock Oil Co. V. Harrell (Action for Damages to Land and Water from Oil Pipeline Leakage).
W72-00353 6E

SOIL DISPOSAL FIELDS
Investigation of Techniques to Provide Advance Warning of Ground-water Pollution Hazards with Special Reference to Aquifers in Glacial Outwash,
W72-00358 5B

SOIL EROSION
Erosion by Water on Hillslopes,
W72-00106 2J

SOIL FORMATION
Gibbsite in Coastal Plain Soils, Southeastern United States,
W72-00090 2G

SOIL MOISTURE
Methods of Calculating Melt-water Percolation (Sposoby rascheta prosachivaniya talykh vod),
W72-00068 2G

Soil Moisture,
W72-00104 2G

Distribution of Moisture in the Unsaturated Profile on a Piedmont Watershed,
W72-00308 2G

Effect of Temperature on Pressure Head-water Content Relationship and Conductivity of Two Soils,
W72-00312 2G

SOIL PROFILES
Distribution of Moisture in the Unsaturated Profile on a Piedmont Watershed,
W72-00308 2G

SOIL TEXTURE
Estimating Soil Permeability Rates,
W72-00345 2G

SOIL TYPES
Varied Responses to India's Agricultural Strategy,
W72-00173 3F

SOIL WATER
Methods of Calculating Melt-water Percolation (Sposoby rascheta prosachivaniya talykh vod),
W72-00068 2G

Nature and Extent of Macropores in Forest Soils and Their Influence on Subsurface water Movement,
W72-00313 2G

SOIL WATER MOVEMENT
Measurement of Interflow and Deep Seepage on Piedmont Watersheds,
W72-00311 2G

Effect of Temperature on Pressure Head-water Content Relationship and Conductivity of Two Soils,
W72-00312 2G

SOIL-WATER-PLANT RELATIONSHIPS
Model for Iso-Osmotic Water Flow in Plant Roots,
W72-00178 2I

SOLAR RADIATION
A Global Classification of Solar Radiation,
W72-00169 2D

Possible Effects of Human Activity on World Climate,
W72-00171 5C

On the Global Solar Radiation Climate and Evapotranspiration Estimates in India,
W72-00180 2D

SOLID STATE DEVICES
Development of an HVDC Solid State Back to Back Asynchronous Tie,
W72-00338 8C

SOLID WASTES
Rehabilitation of Solid Industrial Wastes Disposal Sites,
W72-00031 5E

SOLIDS SEPARATION
Treatment of Wastewaters by Pulsed Adsorption Beds,
W72-00425 5D

SOLS
Coagulation Of Textile Dye Wastes,
W72-00050 5D

SOLVATION
Light Scattering and Ultrasonic Investigations of Relaxation in Aqueous Solutions,
W72-00378 1A

SOLVENT EXTRACTION
Study of Unconventional Methods for Brine Concentration,
W72-00379 3A

SOUNDING
Improved Discrete Depth Sampler,
W72-00093 7B

SOUTH AFRICA
Some Aspects of Resource Use in Relation to the Orange River Project,
W72-00185 3F

Appraisal and Management of Water Resources in South Africa,
W72-00186 6B

SOUTH CAROLINA
Measurement of Interflow and Deep Seepage on Piedmont Watersheds,
W72-00311 2G

South Carolina (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00509 6E

SOUTH DAKOTA
Food Plain Information, Bad River at Fort Pierre, South Dakota.

W72-00055 4A

South Dakota (Analysis of State's Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00510 6E

SPACE MISSIONS
Preliminary Design And Development Of The Intermediate Water Recovery System, (Volume I).
W72-00046 5D

SPECIES DIVERSITY
A Comparative Assessment of Pollution's Effect on the Benthic Macroinvertebrates of the Millers River, Massachusetts Using Factor Analysis, Diversity, Indices and Cluster Analysis of Similarity Coefficients,
W72-00136 5C

SPILLWAYS
Spillway for Kaysinger Bluff Dam Osage River, Missouri, Hydraulic Model Investigation,
W72-00372 8B

SPOKANE VALLEY (WASH)
Investigation of Techniques to Provide Advance Warning of Ground-water Pollution Hazards with Special Reference to Aquifers in Glacial Outwash,
W72-00358 5B

SPRINKLER IRRIGATION
Pressure Distribution on a Center-pivot Sprinkler Irrigation System,
W72-00078 8B

ST. LAWRENCE SEAWAY
The Great Lakes Container Dilemma,
W72-00385 6C

STANDARDS
DESIGN OF A TREATMENT PLANT FOR BAKERY WASTES,
W72-00021 5D

Resolution Establishing Amended Criteria of Stream Water Quality for Various Uses Adopted by the Board on April 14, 1970.
W72-00188 5G

Rules and Regulations--Water Quality Standards.
W72-00194 5G

Water Quality Standards (Interstate Waters, Illinois River and Lower Section of Des Plaines River),
W72-00195 6E

Water Quality Standards (Interstate Waters, Lake Michigan and Little Calumet River, Grand Calumet River and Wolf Lake).
W72-00196 5G

Interstate and Intrastate Water Temperature Standards for Protection of Fish and Aquatic Life.
W72-00198 5G

Summary of Water Quality Standards for Designated use Areas in Michigan Interstate Waters.
W72-00199 5G

Michigan's Intrastate Water Quality Standards--Intrastate Use Designation Areas.
W72-00201 5G

Regulations Concerning Treatment of Wastewaters, Domestic and Industrial, Separately or in Combination, Discharged into the Waters of the Hackensack River.
W72-00206 5D

Regulations Concerning Treatment of Wastewaters, Domestic and Industrial Separately or in Combination, Discharged into the Waters of the Atlantic Coastal Plain, Including the Atlantic Ocean.
W72-00208 5D

Regulations Concerning Treatment of Wastewaters, Domestic and Industrial, Separately or in Combination, Discharged into the Waters of the Wallkill River Basin.
W72-00209 5D

Regulations Concerning Treatment of Wastewaters, Domestic and Industrial, Separately or in Combination, Discharged into the Waters of the Passaic River Including the Newark Bay.
W72-00210 5D

Regulations Concerning Treatment of Wastewaters, Domestic and Industrial, Separately or in Combination, Discharged into the Waters of the Raritan River Basin Including the Raritan Bay.
W72-00211 5D

Regulations Concerning Treatment of Wastewaters, Domestic and Industrial, Separately or in Combination, Discharged into the Waters of the Delaware River Basin.
W72-00212 5D

Pollution of Waters.
W72-00216 6E

Rules and Regulations Establishing Surface Water Quality Criteria.
W72-00219 5G

Regulation Establishing Water Quality Criteria For Interstate And Intrastate Streams.
W72-00225 5G

General Water Quality Criteria For The Definition And Control Of Pollution In The Waters Of Tennessee.
W72-00226 5G

Ecological Determinants In Pollution Control Systems,
W72-00232 5G

Introduction of a Bill to Amend the Clean Air Act and the Federal Water Pollution Control Act,
W72-00241 6E

Water Pollution Control.
W72-00267 6E

Public Bathing Beaches.
W72-00278 6E

In the Matter of Mercury Standards.
W72-00279 5G

Costs and Effects of a Water Quality Program for a Small Strip Mining Company,
W72-00388 5G

Water Quality Criteria for Specified River Basins.
W72-00449 5G

Implementation and Enforcement Plan for Water Quality Regulations.
W72-00453 5G

Michigan (Analysis of Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00493 6E

Nebraska (Analysis of State's Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00497 6E

STATE GOVERNMENTS
The Money Gap - Can States Fill It,
W72-00396 6C

West Virginia (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00515 6E

STATE JURISDICTION
How your Michigan Water Resources Commission Protects Michigan's Lakes and Streams.
W72-00200 6E

Jurisdiction of the Department of Air and Water Pollution Control,
W72-00249 6E

STATISTICAL METHODS
A Comparative Assessment of Pollution's Effect on the Benthic Macroinvertebrates of the Millers River, Massachusetts Using Factor Analysis, Diversity, Indices and Cluster Analysis of Similarity Coefficients,
W72-00136 5C

STEAM
Classification of Public Lands Valuable for Geothermal Steam and Associated Geothermal Resources,
W72-00096 2F

STEEL
Horizontal HCl Pickling Line at Fukuyama,
W72-00004 5D

STILLING BASINS
Outlet Works for Beltzville Dam, Pohopoco Creek, Pennsylvania: Hydraulic Model Investigation,
W72-00369 8B

Outlet Works for New Hope Reservoir Cape Fear River Basin, North Carolina: Hydraulic Model Investigation,
W72-00371 8B

Spillway for Kaysinger Bluff Dam Osage River, Missouri, Hydraulic Model Investigation,
W72-00372 8B

STOCK WATER
Zarrow V Hughes (Liability for Oil and Salt Water Overflow from Oil Well).
W72-00146 6E

Thompson V. Walsh (Injury to Cattle Resulting From Stream Pollution by Oil Lessee).
W72-00400 6E

STOMATA
Osmotic Water Stress: Mesophyll Saturation Deficit and Transpiration Rates of Tamarisk,
W72-00172 2D

The Relative Role of Stomata in Transpiration and Assimilation,
W72-00175 2D

STORM RUN-OFF
Combined Wastewater Collection And Treatment Facility, Mount Clemens, Michigan,
W72-00042 5D

STORM RUNOFF
Dispatching System for Control of Combined Sewer Losses,

STORM RUNOFF

W72-00080 5G

Combined Sewer Overflow Abatement Alternatives: Washington, D.C.,
W72-00082 5D

STORM SURGES
Shoreline Orientation and Storm Surge,
W72-00132 2J

STORM WATER
Combined Sewer Overflow Abatement Alternatives: Washington, D.C.,
W72-00082 5D

STORMS
Shoreline Orientation and Storm Surge,
W72-00132 2J

STRAIN
The Dynamics of Temperature Glaciers from the Detailed Viewpoint,
W72-00087 2C

Elexure of a Floating Ice Tongue,
W72-00330 2C

The Mechanical Properties of Single Crystals of Pure Ice,
W72-00336 2C

STRATIGRAPHY
The Quaternary Deltaic and Channel System in the Central Great Valley, California,
W72-00177 2J

STREAM ASSIMILATIVE CAPACITY
A Methodology For Determining Optimum Longitudinal Spacing of Effluent Discharges Into A River,
W72-00047 5B

STREAMFLOW
Suppression of Channel-Side Chaparral Cover Increases Streamflow,
W72-00054 4A

Index of Surface-Water Records to September 30, 1970--Part 10. The Great Basin.
W72-00098 7C

Index of Surface-Water Records to September 30, 1970--Part 15. Alaska.
W72-00099 7C

Open Channel Flow,
W72-00108 8B

Hydraulic Geometry,
W72-00109 8B

Relation Of Morphometry To Runoff Frequency,
W72-00112 2E

Streamflow, Sediment-Transport, And Water-Temperature Characteristics Of Three Small Watersheds In The Alsea River Basin, Oregon,
W72-00115 2E

Streamflow Routing for Water Pollution Studies,
W72-00124 5G

Interpretation of Results from the Studies of Pollution of Surface Flowing Waters,
W72-00125 5A

Studies of Subsurface Flow (Issledovaniya podzemnogo stoka),
W72-00319 2F

Role of Artesian Water in the Formation of Streamflow as Illustrated by the Tosna River (Otsenka roli napornykh podzemnykh vod v formirovanii rechnogo stoka na primere r. Tosny),
W72-00321 2F

Surface and Subsurface Flow into Rivers of the West Siberian Plain (Poverkhnostnyy i podzemnyy pritok v reki Zapadno-Sibirskoy ravniny),
W72-00326 2F

Perennial Fluctuations of Minimum Streamflow in the European USSR During a Winter Period (Nekotoryye zakonomernosti mnogoletnikh kolebaniy minimal'nogo stoka rek ETS v zimniy period),
W72-00328 2F

STREAMFLOW FORECASTING
Perennial Fluctuations of Minimum Streamflow in the European USSR During a Winter Period (Nekotoryye zakonomernosti mnogoletnikh kolebaniy minimal'nogo stoka rek ETS v zimniy period),
W72-00328 2F

STREAMFLOW INCREASES
Suppression of Channel-Side Chaparral Cover Increases Streamflow,
W72-00054 4A

STREAMFLOW-WATER QUALITY RELATIONSHIPS
Interpretation of Results from the Studies of Pollution of Surface Flowing Waters,
W72-00125 5A

STREAMS
Index of Surface-Water Records to September 30, 1970--Part 10. The Great Basin.
W72-00098 7C

Index of Surface-Water Records to September 30, 1970--Part 15. Alaska.
W72-00099 7C

Stream Preservation in Arkansas.
W72-00190 2E

STRENGTH
The Growth of Bonds and the Increase of Mechanical Strength in a Dry Seasonal Snow-Pack,
W72-00334 2C

STRESS
The Mechanical Properties of Single Crystals of Pure Ice,
W72-00336 2C

STRESS ANALYSIS
Study of Natural Stress Distribution in Rock Massifs with the Help of Seismic-acoustic methods,
W72-00079 8E

STRIP MINE WASTES
Costs and Effects of a Water Quality Program for a Small Strip Mining Company,
W72-00388 5G

STRIP MINES
Costs and Effects of a Water Quality Program for a Small Strip Mining Company,
W72-00388 5G

STRUCTURAL BEHAVIOR
Monte Carlo Study of Seismic Structural Safety,
W72-00072 7C

STRUCTURAL DESIGN
Nelson River HVDC Transmission Line Towers,
W72-00339 8C

SUBMARINES
Sedimentological Sampling and Results from the Diver Lock-out Facility of the Submersible Shelf Diver, Bay of Fundy, Nova Scotia,
W72-00131 2L

SUBMERGED AERATORS
The Case for Deep Aeration Tanks,
W72-00015 5D

SUBSTRATE METABOLISM
An Experimental Valuation of the Intra-particle Resistance in Substrate Transfer to Suspended Zoogloeal Particles,
W72-00433 5D

SUBSURFACE FLOW
Studies of Subsurface Flow (Issledovaniya podzemnogo stoka),
W72-00319 2F

Analysis of the Interaction of River and Subsurface Waters (Nekotoryye elementy analiza vzaimodeystviya rechnykh i podzemnykh vod),
W72-00320 2F

Accuracy of Field Hydrometric Work in Studying Subsurface Flow (Tochnost' ekspeditsionnykh gidrometricheskikh rabot pri izuchenii podzemnogo stoka),
W72-00322 2F

Surface and Subsurface Flow into Rivers of the West Siberian Plain (Poverkhnostnyy i podzemnyy pritok v reki Zapadno-Sibirskoy ravniny),
W72-00326 2F

SUBSURFACE RUNOFF
Studies of Subsurface Flow (Issledovaniya podzemnogo stoka),
W72-00319 2F

Analysis of the Interaction of River and Subsurface Waters (Nekotoryye elementy analiza vzaimodeystviya rechnykh i podzemnykh vod),
W72-00320 2F

Accuracy of Field Hydrometric Work in Studying Subsurface Flow (Tochnost' ekspeditsionnykh gidrometricheskikh rabot pri izuchenii podzemnogo stoka),
W72-00322 2F

Surface and Subsurface Flow into Rivers of the West Siberian Plain (Poverkhnostnyy i podzemnyy pritok v reki Zapadno-Sibirskoy ravniny),
W72-00326 2F

SUBSURFACE WATERS
Studies of Subsurface Flow (Issledovaniya podzemnogo stoka),
W72-00319 2F

Analysis of the Interaction of River and Subsurface Waters (Nekotoryye elementy analiza vzaimodeystviya rechnykh i podzemnykh vod),
W72-00320 2F

Ross V. Fink (Statute Prohibiting Salt Water Flow Over Surface of Land Inapplicable to Pollution by Underground Waters).

W72-00387 6E

SUCCULENT PLANTS
Eco-Physiological Studies on Plants in Arid and Semi-Arid Regions in Western Australia. III. Comparative Studies of Photosynthesis, Respiration and Water Relations of Ten Arid Zone Plants Under Winter and Late Summer Climatic Conditions,
W72-00176 2I

SULFITE LIQUORS
Pulp-mill Waste-water Discharges into Puget Sound: An Industry Viewpoint,
W72-00258 5G

SULFUR COMPOUNDS
Adsorption of Sulfur Containing Taste and Odor Compounds on Activated Carbon,
W72-00423 5D

SULPHATE PULPING
Determination of Sodium in Black Liquor Using a Selective Ion Electrode,
W72-00416 5D

SUPERVISION
Model Law to Improve Dam Safety,
W72-00073 6E

SURF
Some Simple Devices for the Study of Wave Induced Surges,
W72-00056 2E

Beach Processes and Shoreline Changes, Kouchibouguac Bay, New Brunswick,
W72-00133 2L

SURFACE-GROUNDWATER RELATIONSHIPS
Role of Artesian Water in the Formation of Streamflow as Illustrated by the Tosna River (Otsenka roli napornykh podzemnykh vod v formirovanii rechnogo stoka na primere r. Tosny),
W72-00321 2F

SURFACE RUNOFF
An Automatic Runoff Sampler,
W72-00118 7B

Linear Systems Analysis in Hydrology--The Transform approach, the Kernel Oscillations and the Effect of Noise,
W72-00317 2A

Surface and Subsurface Flow into Rivers of the West Siberian Plain (Poverkhnostnyy i podzemnyy pritok v reki Zapadno-Sibirskoy ravniny),
W72-00326 2F

SURFACE-WATER RECORDS (ALASKA)
Index of Surface-Water Records to September 30, 1970--Part 15. Alaska.
W72-00099 7C

SURFACE-WATER RECORDS (GREAT BASIN)
Index of Surface-Water Records to September 30, 1970--Part 10. The Great Basin.
W72-00098 7C

SURFACE WATERS
The Chemical States of Copper in Polluted Fresh Water and a Scheme of Analysis to Differentiate Them,
W72-00126 5B

Studies of Subsurface Flow (Issledovaniya podzemnogo stoka),
W72-00319 2F

Analysis of the Interaction of River and Subsurface Waters (Nekotoryye elementy analiza vzaimodeystviya rechnykh i podzemnykh vod),
W72-00320 2F

SURGES
Some Simple Devices for the Study of Wave Induced Surges,
W72-00056 2E

Shoreline Orientation and Storm Surge,
W72-00132 2J

SURVEY
Rehabilitation of Solid Industrial Wastes Disposal Sites,
W72-00031 5E

Some Aspects of the Hydrography of a Relatively Unpolluted Estuary in Southeastern Massachusetts,
W72-00431 5C

SURVEYS
Range Ecology at the Institute,
W72-00166 3F

Evaluation of Natural River Environments: Phase II,
W72-00357 6B

SUSPENDED LOAD
Clarification Of Turbid Water By Filter Fabrics,
W72-00120 5G

SUSPENDED SOLIDS
Combined Wastewater Collection And Treatment Facility, Mount Clemens, Michigan,
W72-00042 5D

SUSQUEHANNA RIVER (CLINTON CO PENN)
Acidity Control in Bald Eagle Creek and West Branch Susquehanna River, Clinton County, Pennsylvania.
W72-00128 5B

SWIMMING
Public Bathing Beaches.
W72-00278 6E

SYSTEMATICS
General Studies on Trematodes in Thailand: Classification of Cercariae in Thailand,
W72-00138 5C

SYSTEMS ANALYSIS
Analysis of Food Processing Wastewaters,
W72-00011 5D

Stochastic Difference Equation Modelling of Hydrologic Processes,
W72-00306 2A

Characteristics and Filtering of Noise in Linear Hydrologic Systems,
W72-00310 2A

Linear Systems Analysis in Hydrology--The Transform approach, the Kernel Oscillations and the Effect of Noise,
W72-00317 2A

TAMARISK
Osmotic Water Stress: Mesophyll Saturation Deficit and Transpiration Rates of Tamarisk,
W72-00172 2D

TANNERY
Clarification of the Lime Bearing Wastes from a Sole Leather Tannery,
W72-00434 5D

TAX RATE
Section 169: Amortization of Pollution Control Facilities.
W72-00218 5G

TAXES
Amenities Rights--Parallels to Pollution Taxes,
W72-00192 5G

Section 169: Amortization of Pollution Control Facilities.
W72-00218 5G

Tax Treatment of Pollution Control Facilities.
W72-00243 5D

Sales and Use Tax.
W72-00266 6E

Pollution Plant Equipment-Tax Benefits.
W72-00273 6E

TAXONOMY
International Environmental Problems--A Taxonomy,
W72-00384 5C

TECHNOLOGY
Technical, Financial, and Administrative Aspects of Water Supply in the Urban Environment in the Americas,
W72-00406 6B

TELEMETRY
Tentative Application of a Telethermometer for Measurement of Water-surface Temperature (Opyt primeneniya distantsionnoy ustanovki dlya izmereniya temperatury poverkhnosti vody),
W72-00070 2H

TELETHERMOMETERS
Tentative Application of a Telethermometer for Measurement of Water-surface Temperature (Opyt primeneniya distantsionnoy ustanovki dlya izmereniya temperatury poverkhnosti vody),
W72-00070 2H

TEMPERATURE
The Effect of Air Temperature and Moisture Stress Upon Leaf Surface Temperatures of Calotropis Procera (Willd.) R. Br.,
W72-00183 2I

Effect of Temperature on Pressure Head-water Content Relationship and Conductivity of Two Soils,
W72-00312 2G

Nomograph Solution of Heat Requirements for Digesters.
W72-00417 5D

TENNESSEE
General Water Quality Criteria For The Definition And Control Of Pollution In The Waters Of Tennessee.
W72-00226 5G

The 1971 Water Pollution Study for the State of Tennessee,
W72-00475 6E

Tennessee Water Quality Control Act of 1971 with Commentary,
W72-00476 6E

Arkansas (Analysis and Comparison with Tennessee Water Pollution Law),
W72-00480 6E

Florida (Analysis and Comparison with Present and Proposed Tennessee Water Pollution Law),

TENNESSEE

W72-00483 6E

Hawaii (Analysis and Comparison with Present and Proposed Tennessee Water Pollution Law),
W72-00484 6E

Iowa (Analysis and Comparison with Present and Proposed Tennessee Water Pollution Law),
W72-00486 6E

Kentucky (Analysis and Comparison with Present and Proposed Tennessee Water Pollution Law),
W72-00488 6E

Maryland (Analysis of Maryland Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00491 6E

Mississippi (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00495 6E

Montana (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00496 6E

New Hampshire (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00499 6E

New Jersey (Analysis of State's Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00500 6E

Pennsylvania (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00507 6E

Rhode Island (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00508 6E

South Carolina (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00509 6E

South Dakota (Analysis of State's Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00510 6E

Annual User Surveillance Fee,
W72-00520 6E

TERTIARY TREATMENT
The Concept of Wastewater Reclamation,
W72-00012 5D

TEST FACILITIES
An Automated Test Facility for Rock Mechanics Research,
W72-00344 8E

TEST PROCEDURES
Methods for Chemical Analysis of Waters and Wastewaters,
W72-00086 2K

TEXAS
Annual Compilation and Analysis of Hydrologic Data for Elm Fork Trinity River, Trinity River Basin, Texas, 1969,
W72-00097 7C

Pickens V. Harrison (Damages to Irrigation Well Caused by Salt Water Pollution from Oil Well).
W72-00214 6E

Tort Liability and the Oil and Gas Industry,
W72-00257 5G

How we Got the Dirtiest Stream in America,
W72-00282 5G

A Method of Tracing Sediment Movement on the Texas Gulf Coast,
W72-00314 2J

Scurlock Oil Co. V. Harrell (Action for Damages to Land and Water from Oil Pipeline Leakage).
W72-00353 6E

General Crude Oil Co. V. Aiken (Groundwater Pollution by Saline Water from Oil Drilling Operations as Creating Permanent Damages).
W72-00363 5G

Gulf Oil Corp. v. alexander (Pollution of Groundwater by Seepage from Salt Water Disposal Pits).
W72-00381 6E

Globe Aircraft Co. v. Thompson (Damages for Acid Poisoning of Cattle).
W72-00418 6E

TEXAS HIGH PLAINS
Infiltration Rates and Groundwater Quality Beneath Cattle Feedlots, Texas High Plains,
W72-00083 5B

TEXTILES
Bio-regenerated Activated Carbon Treatment of Textile Dye Wastewaters,
W72-00003 5D

Effects of Radiation on Textile Wastes and Starch Solutions,
W72-00410 5D

THAILAND
General Studies on Trematodes in Thailand: Classification of Cerceriae in Thailand,
W72-00138 5C

THALASSOSTATIC SEDIMENTS
The Quaternary Deltaic and Channel System in the Central Great Valley, California,
W72-00177 2J

THEORETICAL ANALYSIS
The Relative Role of Stomata in Transpiration and Assimilation,
W72-00175 2D

THERMAL ENERGY
Geothermal Exploration,
W72-00077 2F

THERMAL POLLUTION
Interstate and Intrastate Water Temperature Standards for Protection of Fish and Aquatic Life.
W72-00198 5G

THERMAL POWERPLANTS
Cooling Towers,
W72-00337 8D

THERMAL PROPERTIES
Method of a New Differential Thermal Analysis,
W72-00030 5A

Thermodynamics and Composition of the Liquid Water Phase in Frozen Peat with Application to Infiltration Studies (K voprosu o faxovom sostave vody i teplofizicheskikh kharakteristikakh merzlogo torfa pri izuchenii infil' tratsii),
W72-00327 2F

THERMAL STRESS
The Influence of Oxygen Concentration on Routine Metabolism of Cyprinus Carpio L. in Different Temperature Conditions, (Influenta Concentratiei de Oxigen Asupra Metabolismului Energetic la Cyprinus Carpio L. in Diferite Conditii de Temperatura),
W72-00144 5C

THERMOMETERS
Tentative Application of a Telethermometer for Measurement of Water-surface Temperature (Opyt primeneniya distantsionnoy ustanovki dlya izmereniya temperatury poverkhnosti vody),
W72-00070 2H

TIDAL WATERS
Tidal Waters (Excavating and Dredging Regulation).
W72-00297 6E

TOLEDO (OHIO)
Wastewater Treatment At The Chrysler Corp. Toledo Machining Plant,
W72-00023 5D

TOMCOD
Biological Investigation of Atlantic Tomcod, Microgadus Tomcod (Walbaum), in the Weweantic River Estuary, Massachusetts, 1967,
W72-00139 5C

TOXICITY
Sludge Activity Parameters and Their Application to Toxicity Measurements and Activated Sludge,
W72-00020 5D

The Importance of Avoiding Chemical Contamination for a Successful Cultivation of Marine Organisms,
W72-00149 5C

Effects on Freshwater Microfauna,
W72-00152 5C

Toxicity of Selenium to the Blue-Green Algae, Anacystis Nidulans and Anabaena Variabilis,
W72-00153 5C

TRACERS
A Procedure for Tracing of Kraft Mill Effluent from an Ocean Outfall by Constituent Fluorescence,
W72-00123 5B

A Method of Tracing Sediment Movement on the Texas Gulf Coast,
W72-00314 2J

TRACHINOTUS SP.
Toxicity of Certain Chemicals to Juvenile Pompano,
W72-00143 5C

TRANSECTS
Vegetation Studies in the Simpson Desert, N.T.,

W72-00182 2I

TRANSFER
Terminals for the Loading or Discharge of Petroleum or Chemical Liquids or Products from Vessels.
W72-00299 5G

TRANSMISSION (ELECTRICAL)
Development of an HVDC Solid State Back to Back Asynchronous Tie,
W72-00338 8C

TRANSMISSION (ELECTRICAL)
Hvdc transmission Control Schemes.
W72-00342 8C

TRANSMISSION LINES
Nelson River HVDC Transmission Line Towers,
W72-00339 8C

TRANSPIRATION
The Relative Role of Stomata in Transpiration and Assimilation,
W72-00175 2D

Eco-Physiological Studies on Plants in Arid and Semi-Arid Regions in Western Australia. III. Comparative Studies of Photosynthesis, Respiration and Water Relations of Ten Arid Zone Plants Under Winter and Late Summer Climatic Conditions,
W72-00176 2I

The Effect of Air Temperature and Moisture Stress Upon Leaf Surface Temperatures of Calotropis Procera (Willd.) R. Br.,
W72-00183 2I

TRANSPORTATION
The Great Lakes Container Dilemma,
W72-00385 6C

TREATIES
International Convention For The Prevention Of Pollution Of The Sea By Oil, 1954 (As Amended).
W72-00230 6E

International Cooperation To Curb Fluvial And Maritime Pollution,
W72-00236 5G

TREATMENT FACILITIES
DESIGN OF A TREATMENT PLANT FOR BAKERY WASTES,
W72-00021 5D

Pigskin Tannery Waste,
W72-00024 5D

Manpower Requirements and Needs for Waste Water Treatment Facility Operation,
W72-00033 5D

Combined Wastewater Collection And Treatment Facility, Mount Clemens, Michigan,
W72-00042 5D

Direct Digtal Control at Grand Rapids, Michigan,
W72-00043 5D

Multi-time Period, Facilities Location Problems: A Heuristic Algorithm With Applications To Wastewater Treatment Systems,
W72-00048 5D

Permits for New Outlets and Disposal Systems.
W72-00189 5G

Section 169: Amortization of Pollution Control Facilities.
W72-00218 5G

Rural Water And Sanitation Facilities.
W72-00227 6E

Tax Treatment of Pollution Control Facilities.
W72-00243 5D

Water Pollution Control Act.
W72-00262 6E

Sales and Use Tax.
W72-00266 6E

Water Pollution Abatement Grants to Subdivision of the State.
W72-00268 6E

Tax Deductions for Pollution Control Facilities.
W72-00271 6E

Pollution Plant Equipment-Tax Benefits.
W72-00273 6E

State Certification of Activities Requiring Federal License or Permit.
W72-00293 6E

People V. City of Los Angeles (Municipal Sewage Disposal Regulation by the State Department of Health).
W72-00398 6E

Implications of Nitrogenous BOD in Treatment Plant Design,
W72-00420 5D

TREMATODES
General Studies on Trematodes in Thailand: Classification of Cercariae in Thailand,
W72-00138 5C

TRICKLING FILTERS
Treatment of Wastes from Meat Flour Factories,
W72-00437 5D

A Mathematical Model for a Trickling Filter,
W72-00442 5D

TRINITY RIVER BASIN (TEX)
Annual Compilation and Analysis of Hydrologic Data for Elm Fork Trinity River, Trinity River Basin, Texas, 1969,
W72-00097 7C

TROPICAL REGIONS
The Geomorphology of Central Australia, (Geomorphologie von Zentralaustralien Nach H. Bremer),
W72-00170 2J

TULSA (OKLAI)
Evaluation of Dispersed Pollutional Loads from Urban Areas,
W72-00355 5B

TURBIDITY
REMOVAL OF WHITE WATER EFFLUENT TURBIDITY BY BIOLOGICAL TREATMENT PROCESSES,
W72-00022 5D

Clarification Of Turbid Water By Filter Fabrics,
W72-00120 5G

TURBIDITY REMOVAL
Clarification Of Turbid Water By Filter Fabrics,
W72-00120 5G

ULTRASONIC
Light Scattering and Ultrasonic Investigations of Relaxation in Aqueous Solutions,
W72-00378 1A

ULTRASONIC ABSORPTION
Light Scattering and Ultrasonic Investigations of Relaxation in Aqueous Solutions,
W72-00378 1A

ULTRIFILTRATION
The Use of Ultrafiltration Membranes for Activated Sludge Separation,
W72-00034 5D

UNDERGROUND STORAGE
Combined Sewer Overflow Abatement Alternatives: Washington, D.C.,
W72-00082 5D

UNITED KINGDOM
United Kingdom: Oil in Navigable Waters Act of 1971.
W72-00213 6E

UNITED NATIONS
United States Mission To The United Nations,
W72-00237 5G

UNITED STATES
Rural Water And Sanitation Facilities.
W72-00227 6E

Licensing of Production and Utilization Facilities--Implementation of National Environmental Policy Act of 1969.
W72-00300 5G

National Oil and Hazardous Substances Pollution Contingency Plan.
W72-00301 6E

Farmers Chemical Ass'n v. Union Camp Co. (Denial of Jury Trial When Injunction Sought to Abate Pollution).
W72-00343 6E

UPLANDS
How Does Forest-Range Conversion in Ozark Uplands Affect Runoff,
W72-00164 4A

URBAN RUNOFF
Evaluation of Dispersed Pollutional Loads from Urban Areas,
W72-00355 5B

USSR
Experimental Hydrologic Investigations at Valday (Eksperimental'nvye gidrologicheskiye issledovaniya na Valdaye).
W72-00061 2B

Procedures for Computing Evaporation from 20-Square-Meter Evaporation Pans Based on Observations in GGI-3,000 Evaporimeters (Metodika rascheta ispareniya s basseynov ploshchad'yu 20 m2 po nablyudeniyam v isparitelyakh GGI-3,000),
W72-00062 2D

Characteristics of Evaporation from Industrial Wastes (Osobennosti ispareniya s promyshlennykh stokov),

W72-00063 5B

Effect of Precipitation and Evaporation on Changes in Solution Concentration (Vliyaniye dozhdey i ispareniya na izmeneniye kontsentratsii rastvorov),
W72-00064 5B

Estimation of Intercepted Solid Precipitation and Determination of Evaporation from a Spruce Forest during a Winter Period (Otsenka velichiny zaderzhaniya tverdykh osadkov i opredeleniye ispareniya s yelovogo lesa v zimniy period),
W72-00065 2B

Accurate Measurement of Atmospheric Precipitation by the Tret'yakov Precipitation Gage (O korrektnom izmerenii atmosfernykh osadkov osadkomerom Tret'yakova),
W72-00066 2B

Forest Litter as an Accumulator of Moisture (Lesnaya podstilka--akkumulyator vlagi),
W72-00067 2G

Methods of Calculating Melt-water Percolation (Sposoby raschcta prosachivaniya talykh vod),
W72-00068 2G

Study of the Geometry of Sand Dunes and Estimation of Bottom Sediment Discharge (Issledovaniye geometricheskikh kharakteristik peschanykh gryad i otsenka raskhoda donnykh nanosov),
W72-00069 2J

Tentative Application of a Telethermometer for Measurement of Water-surface Temperature (Opyt primeneniya distantsionnoy ustanovki dlya izmereniya temperatury poverkhnosti vody),
W72-00070 2H

Studies of Subsurface Flow (Issledovaniya podzemnogo stoka),
W72-00319 2F

Analysis of the Interaction of River and Subsurface Waters (Nekotoryye elementy analiza vzaimodeystviya rechnykh i podzemnykh vod),
W72-00320 2F

Role of Artesian Water in the Formation of Streamflow as Illustrated by the Tosna River (Otsenka roli napornykh podzemnykh vod v formirovanii rechnogo stoka na primere r. Tosny),
W72-00321 2F

Accuracy of Field Hydrometric Work in Studying Subsurface Flow (Tochnost' ekspeditsionnykh gidrometricheskikh rabot pri izuchenii podzemnogo stoka),
W72-00322 2F

Study of Ice-Lens Formation Patterns (Issledovaniye zakonomernostey formirovaniya naledey),
W72-00323 2F

Estimation of Groundwater Recharge by Atmospheric Precipitation with Few or no Observations of the Groundwater Regime (Metod otsenki pitaniya gruntovykh vod atmosfernymi osadkami pri nedostatochnosti ili otsutstvii nablyudeniy za rezhimom gruntovykh vod),
W72-00324 2F

Effect of Intensive Groundwater use on Streamflow (Ob issledovanii vliyaniya intensivnoy ekspluatatsii podzemnykh vod na stok rek),
W72-00325 2F

Surface and Subsurface Flow into Rivers of the West Siberian Plain (Poverkhnostnyy i podzemnyy pritok v reki Zapadno-Sibirskoy ravniny),
W72-00326 2F

Thermodynamics and Composition of the Liquid Water Phase in Frozen Peat with Application to Infiltration Studies (K voprosu o faxovom sostave vody i teplofizicheskikh kharakteristikakh merzlogo torfa pri izuchenii infil' tratsii),
W72-00327 2F

Perennial Fluctuations of Minimum Streamflow in the European USSR During a Winter Period (Nekotoryye zakonomernosti mnogoletnikh kolebaniy minimal'nogo stoka rek ETS v zimniy period),
W72-00328 2F

UTAH
Boating Litter and Pollution Control.
W72-00438 6E

Utah (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00511 6E

VACUUM
Chemical Conditioning of Biological Sludges for Vacuum Filtration,
W72-00037 5D

VALUATION
The Valuation of Public Goods,
W72-00392 6B

VALUE
The Valuation of Public Goods,
W72-00392 6B

Values in the Control of Environment,
W72-00404 5G

VAPOR COMPRESSION DISTILLATION
Preliminary Design And Development Of The Intermediate Water Recovery System, (Volume I).
W72-00046 5D

VAPOR PRESSURE
Osmotic Water Stress: Mesophyll Saturation Deficit and Transpiration Rates of Tamarisk,
W72-00172 2D

VEGETATION
Range Ecology at the Institute,
W72-00166 3F

VEGETATION EFFECTS
Suppression of Channel-Side Chaparral Cover Increases Streamflow,
W72-00054 4A

VERMONT
Vermont (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00512 6E

VIRAL INACTIVATION RATE
Inactivation of Virus in Sewage,
W72-00412 5D

VIRGINIA
Waters--Tidal Waters--Power of Legislature to Authorize Pollution of Fisheries.
W72-00215 5G

Tax Deductions for Pollution Control Facilities.
W72-00271 6E

Virginia (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00513 6E

VIRICIDES
Inactivation of Virus in Sewage,
W72-00412 5D

VIRUS
Inactivation of Virus in Sewage,
W72-00412 5D

VISUAL OBSERVATION
New York's Water Quality Surveillance Program,
W72-00424 5G

WALLEYE
Survival and Hatching of Walleye Eggs at Various Dissolved Oxygen Levels,
W72-00142 5C

WARMING SYSTEMS
The Automatic Detection of Low Levels of Dissolved Free Chlorine in Fish Farming Experiments Using Seawater Effluents,
W72-00141 5C

WASHINGTON
Inventory of Glaciers in the North Cascades, Washington,
W72-00060 7C

Pulp-mill Waste-water Discharges into Puget Sound: An Industry Viewpoint,
W72-00258 5G

Rules and Regulations for the Development, Submission and Adoption of Water Pollution Control and Abatement Plans for Sewage Drainage Basins.
W72-00284 5G

Parks and Recreation--Sanitation.
W72-00288 5G

Water Dist. No. 105, King County V State (Approval and Certification for Sewer System Construction).
W72-00333 6E

Implementation and Enforcement Plan for Water Quality Regulations.
W72-00453 5G

Washington (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00514 6E

WASHINGTON COUNTY (OKLAHOMA)
Oklahoma Copan Lake. Little Caney River, Flood Control, Water Qaulity, Water Supply, Fish and Wildlife and Recreation Lake Located in Washington, County.
W72-00348 6G

WASTE ASSIMILATIVE CAPACITY
Use and Abuse of Natural Water Systems,
W72-00380 5D

Impact of Stream Assimilation Capacity on Waste Treatment Requirements,
W72-00432 5C

WASTE DILUTION
Effect of Precipitation and Evaporation on Changes in Solution Concentration (Vliyaniye dozhdey i ispareniya na izmeneniye kontsentratsii rastvorov),

W72-00064 5B

Interpretation of Results from the Studies of Pollution of Surface Flowing Waters,
W72-00125 5A

WASTE DISPOSAL
Permits for New Outlets and Disposal Systems.
W72-00189 5G

Florida Litter Law of 1971.
W72-00203 6E

Regulations Concerning Treatment of Wastewaters, Domestic and Industrial Separately or in Combination, Discharged into the Waters of the Atlantic Coastal Plain, Including the Atlantic Ocean.
W72-00208 5D

Agricultural And Related Wastes Control.
W72-00231 5G

A Bill to Amend the Federal Pollution Control Act, as Amended.
W72-00242 6E

Water Pollution Control Act.
W72-00262 6E

Pollution Control Agency.
W72-00263 6E

Control of Estuarine Pollution,
W72-00290 6E

A Bill to Amend the Fish and Wildlife Coordination Act in Order to Protect Marine Environment by Regulating the Dumping of Wastes in the Coastal and Ocean Waters of the United States.
W72-00292 6E

Boating Litter and Pollution Control.
W72-00438 6E

Annual Progress Report 1969-1970.
W72-00451 5G

WASTE MINIMIZATION
Analysis of Food Processing Wastewaters,
W72-00011 5D

WASTE STORAGE
Tax Deductions for Pollution Control Facilities.
W72-00271 6E

WASTE WATER DISPOSAL
SUBMARINE DISPOSAL OF INDUSTRIAL WASTE,
W72-00041 5E

Gulf Oil Corp. v. alexander (Pollution of Groundwater by Seepage from Salt Water Disposal Pits).
W72-00381 6E

San Francisco Bay-Delta Water Quality Control Program: Final Report.
W72-00454 5G

WASTE WATER (POLLUTION)
Characteristics of Evaporation from Industrial Wastes (Osobennosti ispareniya s promyshlennykh stokov),
W72-00063 5B

The Freshwater-Supply Problems of Mankind,
W72-00187 2A

Use and Abuse of Natural Water Systems,
W72-00380 5D

San Francisco Bay-Delta Water Quality Control Program: Final Report.
W72-00454 5G

Magnolia Petroleum Co. V. McGeeley (Payment for Void Easements as Offset to Recovery for Pollution Damages).
W72-00543 6E

WASTE WATER TREATMENT
Development of a Chemical Denitrification Process,
W72-00001 5D

Development of Immobilized Enzyme Systems for Enhancement of Biological Waste Treatment Processes,
W72-00002 5D

Bio-regenerated Activated Carbon Treatment of Textile Dye Wastewaters,
W72-00003 5D

Phosphate Removal by Activated Sludge,
W72-00008 5D

Coagulants for Waste Water Treatment,
W72-00014 5D

The Case for Deep Aeration Tanks,
W72-00015 5D

Centrifuges in Water and Waste Treatment,
W72-00016 5D

Process Control of Centrifuge Operations,
W72-00017 5D

Sludge Activity Parameters and Their Application to Toxicity Measurements and Activated Sludge,
W72-00020 5D

DESIGN OF A TREATMENT PLANT FOR BAKERY WASTES,
W72-00021 5D

REMOVAL OF WHITE WATER EFFLUENT TURBIDITY BY BIOLOGICAL TREATMENT PROCESSES,
W72-00022 5D

Wastewater Treatment At The Chrysler Corp. Toledo Machining Plant,
W72-00023 5D

Pigskin Tannery Waste,
W72-00024 5D

Operation of a Treatment Works Handling the Wastes from the Processing of Truck Bodies,
W72-00026 5D

Experience in the Treatment and Re-use of Industrial Waste Waters,
W72-00027 5D

Projected Wastewater Treatment Costs in the Organic Chemicals Industry,
W72-00028 5D

Precipitate Flotation of Complexed Cyanide,
W72-00029 5D

Zimpro Wet Oxidation of Soda Pulping Liquors,
W72-00032 5D

Manpower Requirements and Needs for Waste Water Treatment Facility Operation,
W72-00033 5D

The Use of Ultrafiltration Membranes for Activated Sludge Separation,
W72-00034 5D

The Graver C.I. Process Continuous Countercurrent Filtration and Adsorption,
W72-00040 5D

Operational and Maintenance Experience In Screening Digested Sludge,
W72-00044 5D

Studies of Municipal Wastewater Renovation For Industrial Water,
W72-00045 5D

Preliminary Design And Development Of The Intermediate Water Recovery System, (Volume I).
W72-00046 5D

A Study Of Color Removal From Textile Dye Wastes By Chemical Coagulation,
W72-00049 5D

Coagulation Of Textile Dye Wastes,
W72-00050 5D

Use and Abuse of Natural Water Systems,
W72-00380 5D

Feasibility of Computer Control of Wastewater Treatment.
W72-00408 5D

Reduction of Salt Content of Food Processing Liquid Waste Effluent,
W72-00409 5D

Effects of Radiation on Textile Wastes and Starch Solutions,
W72-00410 5D

Disinfection of Algal Laden Waters,
W72-00411 5D

Anaerobic Digestion of Sludges Containing Iron Phosphates,
W72-00414 5D

Phosphate Removal by pH Controlled Lime Dosage,
W72-00415 5D

Nomograph Solution of Heat Requirements for Digesters.
W72-00417 5D

Problems in Obtaining Adequate Sewage Disinfection,
W72-00419 5D

Hydrolysis of Lipids in Wastewater,
W72-00421 5D

Chlorination Dynamics in Wastewater Effluents,
W72-00422 5D

Adsorption of Sulfur Containing Taste and Odor Compounds on Activated Carbon,
W72-00423 5D

Treatment of Wastewaters by Pulsed Adsorption Beds,
W72-00425 5D

Technology and Management of the Environment.

W72-00426 5G

An Experimental Valuation of the Intra-particle Resistance in Substrate Transfer to Suspended Zoogloeal Particles,
W72-00433 5D

Clarification of the Lime Bearing Wastes from a Sole Leather Tannery,
W72-00434 5D

Systemation in Using the Rotating Biological Surface (RBS) Waste Treatment Process,
W72-00435 5D

Treatment by Freezing,
W72-00436 5D

Treatment of Wastes from Meat Flour Factories,
W72-00437 5D

Hydraulic and Process Aspects of Reactor Design, II-Response to Variations,
W72-00439 5D

Anaerobic Lagoons Versus Aerated Lagoons in the Treatment of Packing-House Wastes,
W72-00441 5D

A Mathematical Model for a Trickling Filter,
W72-00442 5D

BOD From Poultry Processing Plants,
W72-00444 5D

Discussion of 'BOD From Poultry Processing Plants',
W72-00445 5D

Purification of Wastes From a German Yeast Plant,
W72-00446 5D

The Copeland Process Fluid Bed System and Pollution Control World Wide,
W72-00447 5D

WASTES

Florida Litter Law of 1971.
W72-00203 6E

WATER

Microfungi in the Water, Mud, and Litter of a Cattail Marsh,
W72-00151 5C

WATER ALLOCATION (POLICY)

Appraisal and Management of Water Resources in South Africa,
W72-00186 6B

WATER ANALYSIS

Methods for Chemical Analysis of Waters and Wastewaters,
W72-00086 2K

Acidity Control in Bald Eagle Creek and West Branch Susquehanna River, Clinton County, Pennsylvania.
W72-00128 5B

Water Resource Pollutant Identification by Digital Computer Analysis of Remote Infrared Sensor Spectral Intensities,
W72-00305 5A

WATER ANALYSIS MANUAL

Methods for Chemical Analysis of Waters and Wastewaters,
W72-00086 2K

WATER BALANCE

Eco-Physiological Studies on Plants in Arid and Semi-Arid Regions in Western Australia. III. Comparative Studies of Photosynthesis, Respiration and Water Relations of Ten Arid Zone Plants Under Winter and Late Summer Climatic Conditions,
W72-00176 2I

Some Aspects of Water Balance in Tenebrionid Beetles and a Thysanuran From the Namib Desert of Southern Africa,
W72-00184 2I

The Freshwater-Supply Problems of Mankind,
W72-00187 2A

WATER CHEMISTRY

The Chemical States of Copper in Polluted Fresh Water and a Scheme of Analysis to Differentiate Them,
W72-00126 5B

Chemistry of Natural waters - III Carbonic Acid,
W72-00127 5A

Water Structure as a Determinant of Ion Distribution in Living Tissue,
W72-00207 1B

Effect of Humic Acids on Iron Analyses in Natural Waters,
W72-00315 2K

WATER CONSUMPTION

The Concept of Wastewater Reclamation,
W72-00012 5D

Satisfying Water Needs in Southern California,
W72-00340 6D

WATER DEMAND

Water Supply for the Future in Southern Nevada.
W72-00181 6D

Interbasin Transfers: Do We Need Them,
W72-00402 6D

WATER DISPOSAL

Ocean Outfall Design: Part I - Literature Review and Theoretical Development,
W72-00356 5B

WATER FACILITIES

Technical, Financial, and Administrative Aspects of Water Supply in the Urban Environment in the Americas,
W72-00406 6B

WATER LAW

Pakistan's Water Problems and the Law of International Rivers,
W72-00179 6E

Costs and Effects of a Water Quality Program for a Small Strip Mining Company,
W72-00388 5G

WATER PERMITS

The Use of the Corps of Engineers Permit Authority as a Tool for Defending the Environment,
W72-00253 5G

WATER POLICY

Patterns of Politics in Water Resources Development,
W72-00075 6E

Some Aspects of Resource Use in Relation to the Orange River Project,
W72-00185 3F

Positive Incentives And Negative Controls,
W72-00239 5G

Water-Economics and Politics,
W72-00407 6B

The Annual Report of the Council of Economic Advisors, 1966.
W72-00467 5G

WATER POLLUTANT IDENTIFICATION

Water Resource Pollutant Identification by Digital Computer Analysis of Remote Infrared Sensor Spectral Intensities,
W72-00305 5A

WATER POLLUTION

Streamflow Routing for Water Pollution Studies,
W72-00124 5G

Interpretation of Results from the Studies of Pollution of Surface Flowing Waters,
W72-00125 5A

Contract Regarding an Interim Supplement to Tanker Liability for Oil Pollution.
W72-00191 5G

Oil Upon the Waters,
W72-00289 5G

Water Resource Pollutant Identification by Digital Computer Analysis of Remote Infrared Sensor Spectral Intensities,
W72-00305 5A

Investigation of Techniques to Provide Advance Warning of Ground-water Pollution Hazards with Special Reference to Aquifers in Glacial Outwash,
W72-00358 5B

Sunray Oil Co. V. Burge (Action Against Petroleum Product Manufacturer for Damage to Livestock from Drinking Poisonous Water.
W72-00401 6E

The Metabolism of Cities,
W72-00403 6B

WATER POLLUTION CONTROL

Pollution of Waters of State.
W72-00095 6E

United States V Northwest Paper Co. (Standing to Bring Qui Tam Action under Refuse Act of 1899).
W72-00121 6E

Enquist V Quaker Oats Co. (Standing to Bring Qui Tam Action Under Refuse Act of 1899, and to Seek Injunction).
W72-00140 6E

Eutrophication,
W72-00165 5C

Resolution Establishing Amended Criteria of Stream Water Quality for Various Uses Adopted by the Board on April 14, 1970.
W72-00188 5G

Rules and Regulations--Water Quality Standards.

W72-00194 5G

Water Quality Standards (Interstate Waters, Illinois River and Lower Section of Des Plaines River),
W72-00195 6E

Water Quality Standards (Interstate Waters, Lake Michigan and Little Calumet River, Grand Calumet River and Wolf Lake).
W72-00196 5G

Rules and Regulations Establishing Minimum Standards Relating to Location, Design, Construction, and Maintenance of Individual Sewage Disposal Systems.
W72-00197 5E

How your Michigan Water Resources Commission Protects Michigan's Lakes and Streams.
W72-00200 6E

Air and Water Pollution Control--Permits.
W72-00202 6E

Florida Litter Law of 1971.
W72-00203 6E

Regulations Concerning Treatment of Wastewaters, Domestic and Industrial, Separately or in Combination, Discharged into the Waters of the Raritan River Basin Including the Raritan Bay.
W72-00211 5D

Pollution of Waters.
W72-00216 6E

Section 169: Amortization of Pollution Control Facilities.
W72-00218 5G

The Water Pollution Control Agency: Legas Basis, Administration Regulations And Staffing,
W72-00221 5G

Water Pollution Control In The USSR And Eastern European Countries,
W72-00222 5G

Water Pollution In International Law,
W72-00223 5G

Regulation Establishing Water Quality Criteria For Interstate And Intrastate Streams.
W72-00225 5G

General Water Quality Criteria For The Definition And Control Of Pollution In The Waters Of Tennessee.
W72-00226 5G

International Convention For The Prevention Of Pollution Of The Sea By Oil, 1954 (As Amended).
W72-00230 6E

Agricultural And Related Wastes Control.
W72-00231 5G

Inability Of Traditional Forms Of Political Order To Adapt To Modern Problems Of International Pollution,
W72-00233 5G

International Developments In Water Pollution Control: Principles Of Responsibility: Continental Europe,
W72-00234 5G

Goals And Strategies For Combating International Pollution,
W72-00235 5G

International Cooperation To Curb Fluvial And Maritime Pollution,
W72-00236 5G

United States Mission To The United Nations,
W72-00237 5G

Positive Incentives And Negative Controls,
W72-00239 5G

Positive Incentives And Negative Controls,
W72-00240 5G

An Act to Ban High Phosphate Detergents.
W72-00244 6E

An Act Concerning the Insurance or Bonding of Oil Companies and Carriers.
W72-00245 6E

Clean Water for Mississippi's Estuaries.
W72-00246 5G

Great Lakes Pollution,
W72-00247 5G

Jurisdiction of the Department of Air and Water Pollution Control,
W72-00249 6E

Principles of Responsibility in International Law,
W72-00251 6E

Lawyers as Human Environmentalists Advocate's Environmental Advice,
W72-00252 6E

The Use of the Corps of Engineers Permit Authority as a Tool for Defending the Environment,
W72-00253 5G

Oil Pollution Control in the Canadian Arctic,
W72-00254 5G

Federal Water Pollution Legislation and Regulations with Particular Reference to the Oil Industry,
W72-00255 5G

Proposed Regulations of the Department of Interior on Oil Pollution Under the Water Quality Improvement Act of 1970.
W72-00259 5G

Interference With Streams and Waters; Protection of Fish and Game.
W72-00261 6E

Water Pollution Control Act.
W72-00262 6E

Pollution Control Agency.
W72-00263 6E

Water Pollution Control.
W72-00267 6E

Protection of Inland Wetlands; Discharge of Waste or Deleterious Substances.
W72-00274 6E

Acquisition of Surface Lands for Water Quality Control.
W72-00275 6E

Thomas J. Anderson, Gordon Rockwell Environmental Protection Act of 1970.
W72-00277 6E

In the Matter of Mercury Standards.
W72-00279 5G

International Law and Pollution of International Rivers and Lakes,
W72-00280 5G

Oil Pollution Problems on the Pacific Coast,
W72-00281 5G

How we Got the Dirtiest Stream in America,
W72-00282 5G

Maine's Oil Spill Legislation: Can a State with an Extensive Interest in its Coastal Resources Protect Itself from Inadequacies in National and International Law,
W72-00283 5G

Rules and Regulations for the Development, Submission and Adoption of Water Pollution Control and Abatement Plans for Sewage Drainage Basins.
W72-00284 5G

Rules and Regulations for Mineral Exploration.
W72-00285 6E

Parks and Recreation--Sanitation.
W72-00288 5G

A Bill to Amend the Fish and Wildlife Coordination Act in Order to Protect Marine Environment by Regulating the Dumping of Wastes in the Coastal and Ocean Waters of the United States.
W72-00292 6E

State Certification of Activities Requiring Federal License or Permit.
W72-00293 6E

New Jersey Water Quality Improvement Act of 1971.
W72-00298 6E

National Oil and Hazardous Substances Pollution Contingency Plan.
W72-00301 6E

Clean Ocean Act.
W72-00302 6E

Navigable Waters: Certain Practices Regulated.
W72-00303 6E

Prevention of Stream Pollution by Sawdust; Powers of Local Government Concerning Water Supplies.
W72-00389 6E

Interstate Water Pollution Control.
W72-00397 6E

The Metabolism of Cities,
W72-00403 6B

Boating Litter and Pollution Control.
W72-00438 6E

River Pollution in International Law,
W72-00450 5G

Annual Progress Report 1969-1970.
W72-00451 5G

Landowner's Right to Relief Against Pollution of His Water Supply by Industrial or Commercial Waste,

W72-00452 6E

Pollution Problems in the Petroleum Industry--Construction of and Compliance with Federal and State Laws,
W72-00455 5G

Cases and Materials on Environmental Law,
W72-00456 6E

Water Pollution Control Programs.
W72-00457 5G

What is Pollution,
W72-00462 5G

Effluents and Affluence,
W72-00464 5G

The Annual Report of the Council of Economic Advisors, 1966.
W72-00467 5G

The Functions and Features of Private Litigation in the Growth of Environmental Law,
W72-00471 6E

The 1971 Water Pollution Study for the State of Tennessee,
W72-00475 6E

Alabama (Analysis and Comparison with Tennessee Water Pollution Control Law),
W72-00477 6E

Alaska (Analysis and Comparison with Tennessee Water Law),
W72-00478 6E

Arizona (Analysis and Comparison with Tennessee Water Pollution Control Law),
W72-00479 6E

Arkansas (Analysis and Comparison with Tennessee Water Pollution Law),
W72-00480 6E

California (Analysis and Comparison with Tennessee Water Pollution Law),
W72-00481 6E

Colorado (Analysis and Comparison with Tennessee Water Pollution Law),
W72-00482 6E

Florida (Analysis and Comparison with Present and Proposed Tennessee Water Pollution Law),
W72-00483 6E

Hawaii (Analysis and Comparison with Present and Proposed Tennessee Water Pollution Law),
W72-00484 6E

Indiana (Analysis and Comparison with Tennessee Water Pollution Law),
W72-00485 6E

Iowa (Analysis and Comparison with Present and Proposed Tennessee Water Pollution Law),
W72-00486 6E

Kansas (Analysis and Comparison of Kansas and Tennessee Water Pollution Law),
W72-00487 6E

Kentucky (Analysis and Comparison with Present and Proposed Tennessee Water Pollution Law),
W72-00488 6E

Louisiana (Analysis of State's Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00489 6E

Maine (Analysis of State's Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00490 6E

Maryland (Analysis of Maryland Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00491 6E

Massachusetts (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00492 6E

Michigan (Analysis of Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00493 6E

Minnesota (Analysis of State's Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00494 6E

Mississippi (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00495 6E

Montana (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00496 6E

Nebraska (Analysis of State's Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00497 6E

Nevada (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00498 6E

New Hampshire (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00499 6E

New Jersey (Analysis of State's Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00500 6E

New Mexico (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00501 6E

New York (Analysis of State's Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00502 6E

North Dakota (Analysis of State's Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00503 6E

Ohio (Analysis of State's Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00504 6E

Oklahoma (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00505 6E

Oregon (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00506 6E

Pennsylvania (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00507 6E

Rhode Island (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00508 6E

South Carolina (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00509 6E

South Dakota (Analysis of State's Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00510 6E

Utah (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00511 6E

Vermont (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00512 6E

Virginia (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00513 6E

Washington (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00514 6E

West Virginia (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00515 6E

Wisconsin (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00516 6E

Wyoming (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00517 6E

Federal Water Pollution Control Act,
W72-00518 6E

Supplement to Federal Program Sections,
W72-00519 6E

WATER POLLUTION CONTROL ACT

Water Quality Standard Certifications.
W72-00294 6E

WATER POLLUTION EFFECTS

A Comparative Assessment of Pollution's Effect on the Benthic Macroinvertebrates of the Millers River, Massachusetts Using Factor Analysis, Diversity, Indices and Cluster Analysis of Similarity Coefficients,

W72-00136 5C

Effects of Copper on Gammarus Pseudolimnaeus, Physa Integra, and Campeloma Decisum in Soft Water,
W72-00148 5C

Jackson V. Clark (Necessity of Causal Relationship Between Pollution Damage and the Conduct of a Defendant).
W72-00159 6E

Eutrophication,
W72-00165 5C

Pickens V. Harrison (Damages to Irrigation Well Caused by Salt Water Pollution from Oil Well).
W72-00214 6E

Water Pollution In International Law,
W72-00223 5G

Ecological Determinants In Pollution Control Systems,
W72-00232 5G

Hazards of Mercury, Special Report to the Secretary's Pesticide Advisory Committee, Department of Health, Education, and Welfare.
W72-00374 5B

Globe Aircraft Co. v. Thompson (Damages for Acid Poisoning of Cattle).
W72-00418 6E

Peterson V. Texas Co. (Liability for Damages Caused by Escape Wastes from Oil Lease),
W72-00458 6E

Town of Braggs V. Slape (Liability for Damages Caused by Municipal Discharge of Raw Sewage).
W72-00460 6E

What is Pollution,
W72-00462 5G

Pure Oil v. Renton (Action for Damages to Realty from Pollution of Stream by Saline Water).
W72-00463 6E

WATER POLLUTION SOURCES

A Field Study of Inorganic Nitrogen Oxidation Rates,
W72-00018 5B

Pollutants Leached from Selected Species of Wood in Log Storage Waters,
W72-00019 5B

Missouri Stream Studies Relating to the 'New Lead Belt',
W72-00089 5B

Residues in Fish, Wildlife, and Estuaries,
W72-00122 5B

A Procedure for Tracing of Kraft Mill Effluent from an Ocean Outfall by Constituent Fluorescence,
W72-00123 5B

The Chemical States of Copper in Polluted Fresh Water and a Scheme of Analysis to Differentiate Them,
W72-00126 5B

Zarrow V Hughes (Liability for Oil and Salt Water Overflow from Oil Well).
W72-00146 6E

Magnolia Pipeline Co V. State (Actions of a Third Party as Defense to Pollution Prosecution).
W72-00160 6E

Eutrophication,
W72-00165 5C

Inter-Governmental Maritime Consultative Organization: Draft Convention On Rights Of Coastal States To Intervene In Casualties On The High Seas Causing Oil Pollution.
W72-00229 6E

Introduction of a Bill to Amend the Clean Air Act and the Federal Water Pollution Control Act,
W72-00241 6E

Great Lakes Pollution,
W72-00247 5G

Licensing and Regulation of use of Oil Spill Cleanup Agents.
W72-00264 6E

Phillips V. Altman (Covenant Not to Sue as a Defense to a Public Nuisance),
W72-00335 6E

General Crude Oil Co. V. Aiken (Groundwater Pollution by Saline Water from Oil Drilling Operations as Creating Permanent Damages).
W72-00363 5G

Controlling Pollution: The Economics of a Cleaner America,
W72-00459 5G

What is Pollution,
W72-00462 5G

Wood Oil Co. v. Vendicott (Damage to Realty and Personalty from Oil Wells).
W72-00465 6E

Kinnischtzke V. City of Glen Ullin (Liability of Municipality Discharging Inadequately Treated Sewage).
W72-00544 6E

WATER POTENTIAL

Osmotic Water Stress: Mesophyll Saturation Deficit and Transpiration Rates of Tamarisk,
W72-00172 2D

WATER PROPERTIES

Tennessee Water Quality Control Act of 1971 with Commentary,
W72-00476 6E

WATER QUALITY

Chlorinated Hydrocarbons: Emerging Implications in Regional Planning,
W72-00038 5B

Interpretation of Results from the Studies of Pollution of Surface Flowing Waters,
W72-00125 5A

Acidity Control in Bald Eagle Creek and West Branch Susquehanna River, Clinton County, Pennsylvania.
W72-00128 5B

The Use of Biological Analyses as Indicators of Water Quality,
W72-00154 5A

Regulation Establishing Water Quality Criteria For Interstate And Intrastate Streams.
W72-00225 5G

Water Quality Standard Certifications.
W72-00294 6E

Arizona (Analysis and Comparison with Tennessee Water Pollution Control Law),
W72-00479 6E

WATER QUALITY ACT

Proposed Regulations of the Department of Interior on Oil Pollution Under the Water Quality Improvement Act of 1970.
W72-00259 5G

WATER QUALITY CONTROL

Horizontal HCl Pickling Line at Fukuyama,
W72-00004 5D

An Experimental Study of the Effect of Channel Surface Roughness on the Reaeration Rate Coefficient,
W72-00039 5G

Flood-Plain Management Must Be Ecologically And Economically Sound,
W72-00117 2E

Acidity Control in Bald Eagle Creek and West Branch Susquehanna River, Clinton County, Pennsylvania.
W72-00128 5B

Rules and Regulations--Water Quality Standards.
W72-00194 5G

Water Quality Standards (Interstate Waters, Illinois River and Lower Section of Des Plaines River),
W72-00195 6E

Summary of Water Quality Standards for Designated use Areas in Michigan Interstate Waters.
W72-00199 5G

Michigan's Intrastate Water Quality Standards--Intrastate Use Designation Areas.
W72-00201 5G

Regulations Concerning Treatment of Wastewaters, Domestic and Industrial, Separately or in Combination, Discharged into the Waters of the Wallkill River Basin.
W72-00209 5D

Pollution of Waters.
W72-00216 6E

Rules and Regulations Establishing Surface Water Quality Criteria.
W72-00219 5G

Ecological Determinants In Pollution Control Systems,
W72-00232 5G

A Bill to Amend the Federal Pollution Control Act, as Amended.
W72-00242 6E

The Use of the Corps of Engineers Permit Authority as a Tool for Defending the Environment,
W72-00253 5G

Pulp-mill Waste-water Discharges into Puget Sound: An Industry Viewpoint,
W72-00258 5G

Water Pollution Control.

W72-00267 6E

International Law and Pollution of International Rivers and Lakes,
W72-00280 5G

New England Interstate Water Pollution Control Commission.
W72-00287 5G

New Jersey Water Quality Improvement Act of 1971.
W72-00298 6E

Water Resource Pollutant Identification by Digital Computer Analysis of Remote Infrared Sensor Spectral Intensities,
W72-00305 5A

Oklahoma Copan Lake. Little Caney River, Flood Control, Water Qaulity, Water Supply, Fish and Wildlife and Recreation Lake Located in Washington, County.
W72-00348 6G

Mechanics of Flow from Stratified Reservoirs in the Interest of Water Quality: Hydraulic Laboratory Investigation,
W72-00361 5F

New York's Water Quality Surveillance Program,
W72-00424 5G

Cattle Feedlots and Alternatives for Waste Management,
W72-00428 5G

Impact of Stream Assimilation Capacity on Waste Treatment Requirements,
W72-00432 5C

Water Quality Criteria for Specified River Basins.
W72-00449 5G

Implementation and Enforcement Plan for Water Quality Regulations.
W72-00453 5G

Effluents and Affluence,
W72-00464 5G

The Annual Report of the Council of Economic Advisors, 1966.
W72-00467 5G

The Legal Profession's Leadership in Rebuilding Environmental Quality,
W72-00472 6E

Alaska (Analysis and Comparison with Tennessee Water Law),
W72-00478 6E

Kansas (Analysis and Comparison of Kansas and Tennessee Water Pollution Law),
W72-00487 6E

New Jersey (Analysis of State's Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00500 6E

New York (Analysis of State's Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00502 6E

Oklahoma (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00505 6E

Oregon (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00506 6E

Pennsylvania (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00507 6E

South Dakota (Analysis of State's Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00510 6E

WATER QUALITY MONITORING
Water Resource Pollutant Identification by Digital Computer Analysis of Remote Infrared Sensor Spectral Intensities,
W72-00305 5A

WATER QUALITY STANDARDS
Costs and Effects of a Water Quality Program for a Small Strip Mining Company,
W72-00388 5G

Colorado (Analysis and Comparison with Tennessee Water Pollution Law),
W72-00482 6E

WATER QUQLITY CONTROL
Reaeration through Low Dams in the Ohio River,
W72-00032 5G

WATER RESOURCES
Appraisal and Management of Water Resources in South Africa,
W72-00186 6B

The Freshwater-Supply Problems of Mankind,
W72-00187 2A

Satisfying Water Needs in Southern California,
W72-00340 6D

Nourishing Public Participation,
W72-00394 6B

The Metabolism of Cities,
W72-00403 6B

Technology and Management of the Environment.
W72-00426 5G

WATER RESOURCES DEVELOPMENT
Patterns of Politics in Water Resources Development,
W72-00075 6E

Water Pollution Control In The USSR And Eastern European Countries,
W72-00222 5G

Prevention of Stream Pollution by Sawdust; Powers of Local Government Concerning Water Supplies.
W72-00389 6E

The Evolution of a Funding Policy,
W72-00395 6B

Effects of Reservoir Operating Policy on Recreation Benefits,
W72-00399 4A

Water-Economics and Politics,
W72-00407 6B

Evaluation Strategies and Water Resource Development,
W72-00429 6B

Wisconsin (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00516 6E

WATER RESOURCES PLANNING
Nourishing Public Participation,
W72-00394 6B

WATER REUSE
Analysis of Food Processing Wastewaters,
W72-00011 5D

The Concept of Wastewater Reclamation,
W72-00012 5D

Experience in the Treatment and Re-use of Industrial Waste Waters,
W72-00027 5D

Studies of Municipal Wastewater Renovation For Industrial Water,
W72-00045 5D

Preliminary Design And Development Of The Intermediate Water Recovery System, (Volume I).
W72-00046 5D

Industrial Effluents of the Northwest,
W72-00427 5G

WATER STORAGE
Forest Litter as an Accumulator of Moisture (Lesnaya podstilka--akkumulyator vlagi),
W72-00067 2G

WATER STRUCTURE
Water Structure as a Determinant of Ion Distribution in Living Tissue,
W72-00207 1B

WATER SUPPLIES
The Freshwater-Supply Problems of Mankind,
W72-00187 2A

WATER SUPPLY
Water Supply for the Future in Southern Nevada.
W72-00181 6D

Loans to Rural Areas for Water Supply and Sewage Disposal Systems.
W72-00260 5G

Oklahoma Copan Lake. Little Caney River, Flood Control, Water Qaulity, Water Supply, Fish and Wildlife and Recreation Lake Located in Washington, County.
W72-00348 6G

Mechanics of Flow from Stratified Reservoirs in the Interest of Water Quality: Hydraulic Laboratory Investigation,
W72-00361 5F

Performance of an Atmospheric Water Resources Research Program in the Hungry Horse Area, Montana, 1969-70 Season.
W72-00375 3B

Multistage Marginal Cost Model of Investment-Pricing Decisions: Application to Urban Water Supply Treatment Facilities,
W72-00386 6C

Interbasin Transfers: Do We Need Them,

W72-00402 6D

The Metabolism of Cities,
W72-00403 6B

Man and His Changing Environment,
W72-00405 5G

Technical, Financial, and Administrative Aspects of Water Supply in the Urban Environment in the Americas,
W72-00406 6B

WATER TABLE
Design Considerations for Agricultural Drains on the Columbia Basin Project,
W72-00341 8B

WATER TEMPERATURE
Tentative Application of a Telethermometer for Measurement of Water-surface Temperature (Opyt primeneniya distantsionnoy ustanovki dlya izmereniya temperatury poverkhnosti vody),
W72-00070 2H

Streamflow, Sediment-Transport, And Water-Temperature Characteristics Of Three Small Watersheds In The Alsea River Basin, Oregon,
W72-00115 2E

Survival and Hatching of Walleye Eggs at Various Dissolved Oxygen Levels,
W72-00142 5C

The Influence of Oxygen Concentration on Routine Metabolism of Cyprinus Carpio L. in Different Temperature Conditions, (Influenta Concentratiei de Oxigen Asupra Metabolismului Energetic la Cyprinus Carpio L. in Diferite Conditii de Temperatura),
W72-00144 5C

Interstate and Intrastate Water Temperature Standards for Protection of Fish and Aquatic Life.
W72-00198 5G

WATER TREATMENT
Preliminary Design And Development Of The Intermediate Water Recovery System, (Volume I).
W72-00046 5D

Treatment by Freezing,
W72-00436 5D

WATER TREATMENT COSTS
Costs and Effects of a Water Quality Program for a Small Strip Mining Company,
W72-00388 5G

WATER TYPES
The Role Of Water In Rock Disintegration,
W72-00103 2J

WATER UTILIZATION
Appraisal and Management of Water Resources in South Africa,
W72-00186 6B

Resolution Establishing Amended Criteria of Stream Water Quality for Various Uses Adopted by the Board on April 14, 1970.
W72-00188 5G

Summary of Water Quality Standards for Designated use Areas in Michigan Interstate Waters.
W72-00199 5G

Michigan's Intrastate Water Quality Standards--Intrastate Use Designation Areas.
W72-00201 5G

General Water Quality Criteria For The Definition And Control Of Pollution In The Waters Of Tennessee.
W72-00226 5G

Impact of Stream Assimilation Capacity on Waste Treatment Requirements,
W72-00432 5C

WATER VAPOR
Development of a Stability Correction for Estimating Convective Transfer,
W72-00316 2B

WATER YIELD
Study of Unconventional Methods for Brine Concentration,
W72-00379 3A

WATERLOGGED LAND
Design Considerations for Agricultural Drains on the Columbia Basin Project,
W72-00341 8B

WATERSHED MANAGEMENT
Flood-Plain Management Must Be Ecologically And Economically Sound,
W72-00117 2E

WATERSHEDS (BASINS)
Evaluation of Dispersed Pollutional Loads from Urban Areas,
W72-00355 5B

WAVE GAGES
Analysis of Wave Records,
W72-00350 7B

Comparison of Pressure and Staff Wave Gage Records,
W72-00352 7B

WAVE RECORDERS
Some Simple Devices for the Study of Wave Induced Surges,
W72-00056 2E

WAVEMAKERS
Waves Generated by Piston-Type Wavemaker,
W72-00351 8B

WAVES (WATER)
Some Simple Devices for the Study of Wave Induced Surges,
W72-00056 2E

Shoreline Orientation and Storm Surge,
W72-00132 2J

Analysis of Wave Records,
W72-00350 7B

Waves Generated by Piston-Type Wavemaker,
W72-00351 8B

Comparison of Pressure and Staff Wave Gage Records,
W72-00352 7B

WEATHER MODIFICATION
Possible Effects of Human Activity on World Climate,
W72-00171 5C

WEATHERING
Gibbsite in Coastal Plain Soils, Southeastern United States,
W72-00090 2G

The Role Of Water In Rock Disintegration,
W72-00103 2J

WELL PERMITS
Mineral Well Act.
W72-00276 6E

WELL REGULATION
Mineral Well Act.
W72-00276 6E

WEST SIBERIAN PLAIN
Surface and Subsurface Flow into Rivers of the West Siberian Plain (Poverkhnostnyy i podzemnyy pritok v reki Zapadno-Sibirskoy ravniny),
W72-00326 2F

WEST VIRGINIA
West Virginia (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00515 6E

WESTERN AUSTRALIA
Eco-Physiological Studies on Plants in Arid and Semi-Arid Regions in Western Australia. III. Comparative Studies of Photosynthesis, Respiration and Water Relations of Ten Arid Zone Plants Under Winter and Late Summer Climatic Conditions,
W72-00176 2I

WESTLAND
Utilization of Interstate Highway Construction to Create Productive Wetlands for Wildlife,
W72-00053 4C

WHITE IBIS
Movement-Behavior in Three Species of Colonial-Nesting Wading Birds: A Radio-Telemetric Study,
W72-00051 7B

WHITE WATER
REMOVAL OF WHITE WATER EFFLUENT TURBIDITY BY BIOLOGICAL TREATMENT PROCESSES,
W72-00022 5D

WILD RIVERS
Evaluation of Natural River Environments: Phase II,
W72-00357 6B

WILDLIFE HABITATS
Movement-Behavior in Three Species of Colonial-Nesting Wading Birds: A Radio-Telemetric Study,
W72-00051 7B

Management Model for Terrestrial Wildlife Based on Energy Relationships,
W72-00052 6G

Utilization of Interstate Highway Construction to Create Productive Wetlands for Wildlife,
W72-00053 4C

WIND TIDES
Shoreline Orientation and Storm Surge,
W72-00132 2J

WINDS
Beach Processes and Shoreline Changes, Kouchibouguac Bay, New Brunswick,
W72-00133 2L

WISCONSIN
Pollution Plant Equipment-Tax Benefits.
W72-00273 6E

Wisconsin (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),

WISCONSIN

W72-00516 6E

WYOMING
Wyoming (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00517 6E

XEROPHILIC ANIMALS
Some Aspects of Water Balance in Tenebrionid Beetles and a Thysanuran From the Namib Desert of Southern Africa,
W72-00184 2I

XEROPHYTES
Eco-Physiological Studies on Plants in Arid and Semi-Arid Regions in Western Australia. III. Comparative Studies of Photosynthesis, Respiration and Water Relations of Ten Arid Zone Plants Under Winter and Late Summer Climatic Conditions,
W72-00176 2I

Vegetation Studies in the Simpson Desert, N.T.,
W72-00182 2I

The Effect of Air Temperature and Moisture Stress Upon Leaf Surface Temperatures of Calotropis Procera (Willd.) R. Br.,
W72-00183 2I

YEASTS
Purification of Wastes From a German Yeast Plant,
W72-00446 5D

ZETA POTENTIAL
A Study Of Color Removal From Textile Dye Wastes By Chemical Coagulation,
W72-00049 5D

ZOOGLOEA RAMIGERA
An Experimental Valuation of the Intra-particle Resistance in Substrate Transfer to Suspended Zoogloeal Particles,
W72-00433 5D

ZOOPLANKTON
Effects of Zooplankton on Algae in Westhampton Lake,
W72-00150 5C

AUTHOR INDEX

ABLES, JACKSON H. JR
Effect of Valve Position in a Sidewall Port Filling System, Newburgh Lock, Ohio River: Hydraulic Model Investigation,
W72-00346 8B

ACORD, C. R.
Beef Production on Irrigated Alfalfa-D Pastures,
W72-00537 3F

ALEXANDER, VERA
Dynamics of the Nitrogen Cycle in Lakes,
W72-00354 5C

ALLEN, D. R.
Design and Operation of a Triaxial, High-Temperature, High-Pressure Compaction Apparatus,
W72-00058 2J

ALTER, A. J.
Treatment by Freezing,
W72-00436 5D

ANDERSON, B. B. JR
Jurisdiction of the Department of Air and Water Pollution Control,
W72-00249 6E

ARTHUR, J. W.
Effects of Copper on Gammarus Pseudolimnaeus, Physa Integra, and Campeloma Decisum in Soft Water,
W72-00148 5C

AUBERTIN, G. M.
Nature and Extent of Macropores in Forest Soils and Their Influence on Subsurface water Movement,
W72-00313 2G

AVAULT, J. W. JR
Toxicity of Certain Chemicals to Juvenile Pompano,
W72-00143 5C

BAILLOD, C. R.
An Experimental Valuation of the Intra-particle Resistance in Substrate Transfer to Suspended Zoogloeal Particles,
W72-00433 5D

BAKER, C. D.
Separation of Taxonomically Identifiable Organisms and Detritus Taken from Shad Foregut Contents Using Density Gradient Centrifugation, 1970, Prosobranchia Muricidae,
W72-00529 2I

BALDEN, A. R.
Wastewater Treatment At The Chrysler Corp. Toledo Machining Plant,
W72-00023 5D

BALL, JAMES W.
Expansion of Santa Barbara Harbor, California. Hydraulic Model Investigation,
W72-00349 6B

Wave Action in Mission Bay Harbor, California: Hydraulic Model Investigation,
W72-00367 8B

BARNETT, H.
Environmental Policy and Management,
W72-00390 6B

BARNHART, E. L.
A Critical Review of BOD Analysis Using Respirometer Techniques,
W72-00036 5A

BARROW, P.
Some Aspects of the Hydrography of a Relatively Unpolluted Estuary in Southeastern Massachusetts,
W72-00431 5C

BATEMAN, D. L.
Movement-Behavior in Three Species of Colonial-Nesting Wading Birds: A Radio-Telemetric Study,
W72-00051 7B

BATTAN, L. J.
Summer Rainfall over the Santa Catalina Mountains,
W72-00168 2B

BATTEY, R. F.
Study of Unconventional Methods for Brine Concentration,
W72-00379 3A

BATTISTA, G. F.
Improved Discrete Depth Sampler,
W72-00093 7B

BAUMGARTNER, D. J.
Ocean Outfall Design: Part I - Literature Review and Theoretical Development,
W72-00356 5B

A Procedure for Tracing of Kraft Mill Effluent from an Ocean Outfall by Constituent Fluorescence,
W72-00123 5B

BAXTER, R. R.
International Cooperation To Curb Fluvial And Maritime Pollution,
W72-00236 5G

BEHRENS, S.
The Distribution and Abundance of the Inter Tidal Prosobranchs Littorina-Scutulata and Littorina-Sitkana,
W72-00565 2I

BELLA, DAVID A.
Subtle Aspects of Ecosystem Management,
W72-00430 6G

BENSON, D. J.
Pulp-mill Waste-water Discharges into Puget Sound: An Industry Viewpoint,
W72-00258 5G

BERGSTROM, K. L.
Utilization of Interstate Highway Construction to Create Productive Wetlands for Wildlife,
W72-00053 4C

BERNHARD, M.
The Importance of Avoiding Chemical Contamination for a Successful Cultivation of Marine Organisms,
W72-00149 5C

BERRY, P. S.
The Legal Future: New Theories of Environmental Protection,
W72-00469 6E

BHALLA, HARJIT S.
Multi-time Period, Facilities Location Problems: A Heuristic Algorithm With Applications To Wastewater Treatment Systems,
W72-00048 5D

BHATTACHARYYA, D.
Precipitate Flotation of Complexed Cyanide,
W72-00029 5D

BIRDSONG, C. L.
Toxicity of Certain Chemicals to Juvenile Pompano,
W72-00143 5C

BISHOP, JOHN W.
Effects of Zooplankton on Algae in Westhampton Lake,
W72-00150 5C

BLAKE, C. J.
Suing the Polluter: Approaches to Achieve Standing,
W72-00256 5G

BLANCHARD, WILLIAM
Federal Water Pollution Control Act,
W72-00518 6E

Massachusetts (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00492 6E

Mississippi (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00495 6E

Rhode Island (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00508 6E

BOHAN, JOSEPH P.
Mechanics of Flow from Stratified Reservoirs in the Interest of Water Quality: Hydraulic Laboratory Investigation,
W72-00361 5F

BOLTER, E.
Missouri Stream Studies Relating to the 'New Lead Belt',
W72-00089 5B

BORN, I. R.
Treatment of Wastes from Meat Flour Factories,
W72-00437 5D

BOURNE, C. B.
International Law and Pollution of International Rivers and Lakes,
W72-00280 5G

BOYLE, W. C.
An Experimental Valuation of the Intra-particle Resistance in Substrate Transfer to Suspended Zoogloeal Particles,
W72-00433 5D

BRADFORD, P. A.
Maine's Oil Spill Legislation: Can a State with an Extensive Interest in its Coastal Resources Protect Itself from Inadequacies in National and International Law,
W72-00283 5G

BRAMER, H. C.
Projected Wastewater Treatment Costs in the Organic Chemicals Industry,

BRANDT, R. A. M.

W72-00028 5D

BRANDT, R. A. M.
General Studies on Trematodes in Thailand: Classification of Cercariae in Thailand,
W72-00138 5C

BRASFEILD, CHARLES W.
Wave Action in Mission Bay Harbor, California: Hydraulic Model Investigation,
W72-00367 8B

BRASFIELD, CHARLES W.
Design for Expansion of Port San Luis, California; Hydraulic Model Investigation,
W72-00366 8B

Expansion and Revision of Kawaihae Harbor, Hawaii: Hydraulic Model Investigation,
W72-00364 8B

Expansion of Santa Barbara Harbor, California. Hydraulic Model Investigation,
W72-00349 6B

BRESLER, E.
A Model for the Economic Evaluation of Water Quality in Irrigation,
W72-00382 3F

BREZONIK, P. L.
Sludge Activity Parameters and Their Application to Toxicity Measurements and Activated Sludge,
W72-00020 5D

BROHL, R. E.
Design Considerations for Agricultural Drains on the Columbia Basin Project,
W72-00341 8B

BROWN, D. D.
Varied Responses to India's Agricultural Strategy,
W72-00173 3F

BROWN, RICHARD D.
The Use of Biological Analyses as Indicators of Water Quality,
W72-00154 5A

BROWN, W.
DESIGN OF A TREATMENT PLANT FOR BAKERY WASTES,
W72-00021 5D

BRYANT, E. A.
Beach Processes and Shoreline Changes, Kouchibouguac Bay, New Brunswick,
W72-00133 2L

BRYANT, H. L.
Costs and Effects of a Water Quality Program for a Small Strip Mining Company,
W72-00388 5G

BUCKINGHAM, PHILLIP L.
Combined Sewer Overflow Abatement Alternatives: Washington, D.C.,
W72-00082 5D

BUCKNER, THOMAS
Alabama (Analysis and Comparison with Tennessee Water Pollution Control Law),
W72-00477 6E

Minnesota (Analysis of State's Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00494 6E

North Dakota (Analysis of State's Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00503 6E

Virginia (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00513 6E

BUDEL, J.
The Geomorphology of Central Australia, (Geomorphologie von Zentralaustralien Nach H. Bremer),
W72-00170 2J

BUNAMO, M.
The Great Lakes Container Dilemma,
W72-00385 6C

BURKEHEAD, C. E.
Composition Studies of Activated Sludge,
W72-00443 5D

BURLACU, GH.
The Influence of Oxygen Concentration on Routine Metabolism of Cyprinus Carpio L. in Different Temperature Conditions, (Influenta Concentratiei de Oxigen Asupra Metabolismului Energetic la Cyprinus Carpio L. in Diferite Conditii de Temperatura),
W72-00144 5C

BUROV, A. S.
Estimation of Intercepted Solid Precipitation and Determination of Evaporation from a Spruce Forest during a Winter Period (Otsenka velichiny zaderzhaniya tverdykh osadkov i opredeleniye ispareniya s yelovogo lesa v zimniy period),
W72-00065 2B

BUSCH, A. W.
Hydraulic and Process Aspects of Reactor Design, II-Response to Variations,
W72-00439 5D

Kinetic and Stoichiometric Limitations of Phosphate in Pure and Mixed Bacterial Cultures,
W72-00440 5C

Use and Abuse of Natural Water Systems,
W72-00380 5D

BUSHNELL, J. H.
Preliminary Biological Reconnaissance of Aquatic Habitats, Cumberland Peninsula, Baffin Island,
W72-00568 2I

CAGLE, J. B.
Apparatus for Controlling Ambient Light Cycles in Experimental Environments,
W72-00525 7B

CALLERY, ROBERT L.
Dispatching System for Control of Combined Sewer Losses,
W72-00080 5G

CARLSON, C. A.
Impacts of Nuclear Power Plants on the Environment,
W72-00534 5C

CARPENTER, W. L.
REMOVAL OF WHITE WATER EFFLUENT TURBIDITY BY BIOLOGICAL TREATMENT PROCESSES,
W72-00022 5D

CARSON, M. A.
Soil Moisture,
W72-00104 2G

CASTO, D. M. III
The Use of the Corps of Engineers Permit Authority as a Tool for Defending the Environment,
W72-00253 5G

CHAMBERS, S. P.
Private Action Under the Public Trust: An Environmental Bill of Rights for California,
W72-00272 5G

CHANCELLOR, W. J.
Stress Strain Characteristics of a Saturated Clay Soil at Various Rates of Strain,
W72-00546 2G

CHANNON, R. D.
The Bristol Fall Column for Coarse Sediment Grading,
W72-00057 2J

CHATHAM, CLAUDE E. JR
Design for Expansion of Port San Luis, California; Hydraulic Model Investigation,
W72-00366 8B

Expansion and Revision of Kawaihae Harbor, Hawaii: Hydraulic Model Investigation,
W72-00364 8B

CHILINGAR, G. V.
Design and Operation of a Triaxial, High-Temperature, High-Pressure Compaction Apparatus,
W72-00058 2J

CHIYONOBU, T.
Horizontal HCl Pickling Line at Fukuyama,
W72-00004 5D

CHORLEY, R. J.
The Drainage Basin As The Fundamental Geomorphic Unit,
W72-00102 2J

The Role Of Water In Rock Disintegration,
W72-00103 2J

CHOU, Y-T
Discussion of Stress Characteristics of a Saturated Clay Soil at Various Rates of Strain,
W72-00547 2G

CHULAVACHANA, P.
An Experimental Study of the Effect of Channel Surface Roughness on the Reaeration Rate Coefficient,
W72-00039 5G

CLARKE, O. M. JR
Gibbsite in Coastal Plain Soils, Southeastern United States,
W72-00090 2G

CLEMENS, M. M.
Coagulants for Waste Water Treatment,
W72-00014 5D

CLEVELAND, JERRY G.
Evaluation of Dispersed Pollutional Loads from Urban Areas,
W72-00355 5B

COE, J. M.
Satisfying Water Needs in Southern California,

W72-00340 6D

COFFEY, J. J.
Chemical Conditioning of Biological Sludges for Vacuum Filtration,
W72-00037 5D

COLBY, C.
Salt and Water Balance in Stonefly Naiads Pteronarcys-Californica Plecoptera,
W72-00561 2I

COLLINS, HARVEY F.
Problems in Obtaining Adequate Sewage Disinfection,
W72-00419 5D

COOK, C. B.
Uptake of Sulfur-35 Amino-Acids by Symbiotic Algae Zoochlorellae from the Food of Green Hydra,
W72-00569 5C

COOK, D. O.
Some Simple Devices for the Study of Wave Induced Surges,
W72-00056 2E

COOK, H. N.
Nourishing Public Participation,
W72-00394 6B

COOK, R. J.
Effect of Soil Water on Microbial Growth Antagonism and Nutrient Availability in Relation to Soil-Borne Fungal Diseases of Plants,
W72-00556 5C

COOKE, R. U.
Public Perception of Environmental Quality in Tucson, Arizona,
W72-00174 5G

COOKSON, JOHN T. JR
Adsorption of Sulfur Containing Taste and Odor Compounds on Activated Carbon,
W72-00423 5D

COPELAND, G. G.
The Copeland Process Fluid Bed System and Pollution Control World Wide,
W72-00447 5D

COWAN, I. R.
The Relative Role of Stomata in Transpiration and Assimilation,
W72-00175 2D

CRANE, JOHN D.
Effects of Radiation on Textile Wastes and Starch Solutions,
W72-00410 5D

CROSBY, J. W. II
Geothermal Exploration,
W72-00077 2F

CROSBY, JAMES W. III
Investigation of Techniques to Provide Advance Warning of Ground-water Pollution Hazards with Special Reference to Aquifers in Glacial Outwash,
W72-00358 5B

CROSS, O. E.
An Automatic Runoff Sampler,
W72-00118 7B

CUNNINGHAM, RICHARD K.
Preliminary Investigation of the Low Dissolved Oxygen Concentrations that Exist in Long Lake Located Near Spokane, Washington,
W72-00156 5C

CURTIS, JAMES
Direct Digtal Control at Grand Rapids, Michigan,
W72-00043 5D

DANIELS, R. B.
Stability of Coastal Plain Surfaces,
W72-00091 2J

D'ARGE, RALPH C.
Evaluation Strategies and Water Resource Development,
W72-00429 6B

DAS, K. C.
Effect of Rainfall on the Resistance in Channels with Shallow Flow,
W72-00307 8B

DATAR, S. V.
On the Global Solar Radiation Climate and Evapotranspiration Estimates in India,
W72-00180 2D

DAUSE, J. L.
Discussion of 'BOD From Poultry Processing Plants',
W72-00445 5D

DAVIDSON, GEORGE R. JR
A Study Of Color Removal From Textile Dye Wastes By Chemical Coagulation,
W72-00049 5D

DAVIDSON, P.
The Valuation of Public Goods,
W72-00392 6B

DAVY, F. B.
Interference with a Memory Process by DDT in Goldfish,
W72-00567 5C

DAWSON, DAVID
Maryland (Analysis of Maryland Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00491 6E

West Virginia (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00515 6E

DAYAN, VICTOR H.
Development of a Chemical Denitrification Process,
W72-00001 5D

DEACON, RONALD W.
A Methodology For Determining Optimum Longitudinal Spacing of Effluent Discharges Into A River,
W72-00047 5B

DEBOER, D. W.
Flood Damage to Crops in Depression Areas of Northcentral Iowa,
W72-00542 3F

DELLEUR, J. W.
Characteristics and Filtering of Noise in Linear Hydrologic Systems,
W72-00310 2A

Linear Systems Analysis in Hydrology--The Transform approach, the Kernel Oscillations and the Effect of Noise,
W72-00317 2A

DIGREGORIO, D.
The Use of Ultrafiltration Membranes for Activated Sludge Separation,
W72-00034 5D

DINGELL, J. D.
Great Lakes Pollution,
W72-00247 5G

DIONNE, J. C.
Exotic Pebbles in Quaternary Deposits from the South Coast of the St. Lawrence Estuary, Quebec,
W72-00134 2L

DOBROUMOV, B. M.
Perennial Fluctuations of Minimum Streamflow in the European USSR During a Winter Period (Nekotoryye zakonomernosti mnogoletnikh kolebaniy minimal'nogo stoka rek ETS v zimniy period),
W72-00328 2F

DOIG, M. T. III
Effect of Humic Acids on Iron Analyses in Natural Waters,
W72-00315 2K

DOLA, A.
The Evolution of a Funding Policy,
W72-00395 6B

DONOVAN, THOMAS K.
Inactivation of Virus in Sewage,
W72-00412 5D

DORN, P. R.
Comparative Fatty-Acid Changes During the Rapid Growth of Trout in Salt Water Ponds,
W72-00557 2I

DOUDOROFF, P.
Dissolved Oxygen Requirements of Freshwater Fishes,
W72-00530 5C

DRAKE, C. H.
Investigation of Techniques to Provide Advance Warning of Ground-water Pollution Hazards with Special Reference to Aquifers in Glacial Outwash,
W72-00358 5B

DRAPEAU, G.
Sand Waves on Browns Bank Observed from the Shelf Diver,
W72-00130 2J

DREESE, G. R.
Costs and Effects of a Water Quality Program for a Small Strip Mining Company,
W72-00388 5G

DUNN, J. D.
Oil Pollution Problems on the Pacific Coast,
W72-00281 5G

DURY, G. H.
Hydraulic Geometry,
W72-00109 8B

Relation Of Morphometry To Runoff Frequency,
W72-00112 2E

ECHELBERGER, W. F.
Chemical Conditioning of Biological Sludges for Vacuum Filtration,

ECHELBERGER, WAYNE F. JR
W72-00037 5D

ECHELBERGER, WAYNE F. JR
Disinfection of Algal Laden Waters,
W72-00411 5D

ECKENFELDER, W. W.
Manpower Requirements and Needs for Waste Water Treatment Facility Operation,
W72-00033 5D

ECKHARDT, B.
How we Got the Dirtiest Stream in America,
W72-00282 5G

EDNEY, E. B.
Some Aspects of Water Balance in Tenebrionid Beetles and a Thysanuran From the Namib Desert of Southern Africa,
W72-00184 2I

EHRENFELD, D. W.
Ecological Determinants In Pollution Control Systems,
W72-00232 5G

EIPPER, A. W.
Impacts of Nuclear Power Plants on the Environment,
W72-00534 5C

EL-DOMIATY, A. M.
Stress Strain Characteristics of a Saturated Clay Soil at Various Rates of Strain,
W72-00546 2G

ELLIS, B. G.
The Nutrient Content of Drainage Water from Agricultural Land,
W72-00157 5C

EMERSON, D. B.
DESIGN OF A TREATMENT PLANT FOR BAKERY WASTES,
W72-00021 5D

ERICKSON, A. E.
The Nutrient Content of Drainage Water from Agricultural Land,
W72-00157 5C

ESSON, D. M. R.
Oil Upon the Waters,
W72-00289 5G

ESTEVA, D.
Comparison of Pressure and Staff Wave Gage Records,
W72-00352 7B

ETNIER, D. A.
Food of 3 Species of Sunfishes Lepomis Centrarchidae and Their Hybrids in 3 Minnesota Lakes,
W72-00524 2H

EVANS, I. S.
The Geomorphology And Morphometry Of Glacial And Nival Areas,
W72-00110 2C

EYE, J. D.
Clarification of the Lime Bearing Wastes from a Sole Leather Tannery,
W72-00434 5D

FALK, R. A.
Inability Of Traditional Forms Of Political Order To Adapt To Modern Problems Of International Pollution,
W72-00233 5G

FARRELL, JAMES O.
Effect of Valve Position in a Sidewall Port Filling System, Newburgh Lock, Ohio River: Hydraulic Model Investigation,
W72-00346 8B

FEDOROV, S. F.
Estimation of Intercepted Solid Precipitation and Determination of Evaporation from a Spruce Forest during a Winter Period (Otsenka velichiny zaderzhaniya tverdykh osadkov i opredeleniye ispareniya s yelovogo lesa v zimniy period),
W72-00065 2B

FELDMAN, M. H.
A Procedure for Tracing of Kraft Mill Effluent from an Ocean Outfall by Constituent Fluorescence,
W72-00123 5B

FENTON, R. L.
Investigation of Techniques to Provide Advance Warning of Ground-water Pollution Hazards with Special Reference to Aquifers in Glacial Outwash,
W72-00358 5B

FERGUSON, JAMES A.
How Does Forest-Range Conversion in Ozark Uplands Affect Runoff,
W72-00164 4A

FINK, MICHAEL
California (Analysis and Comparison with Tennessee Water Pollution Law),
W72-00481 6E

Indiana (Analysis and Comparison with Tennessee Water Pollution Law),
W72-00485 6E

Maine (Analysis of State's Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00490 6E

Vermont (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00512 6E

FISCHERHOF, H.
Liability In National And International Law For Damage Through Water Pollution,
W72-00224 5G

FISHER, R. F.
Environmental Lawyer in the Lion's Mouth: Litigation Before and Against Administrative Agencies,
W72-00473 6E

FITSGERALD, C. L.
Coagulants for Waste Water Treatment,
W72-00014 5D

FLIPPO, H. N. JR
Acidity Control in Bald Eagle Creek and West Branch Susquehanna River, Clinton County, Pennsylvania.
W72-00128 5B

Chemical and Biological Conditions in Bald Eagle Creek and Prognosis of Trophic Characteristics of Foster Joseph Sayers Reservoir, Centre County, Pennsylvania,
W72-00129 5C

FLORCZYK, H.
Interpretation of Results from the Studies of Pollution of Surface Flowing Waters,
W72-00125 5A

FOEHRENBACH, JACK
Eutrophication,
W72-00165 5C

FOSTER, R. C.
Free Amino-Acid and Electrolyte Adjustments in the Sipunculid Worm Themiste-Dyscritum During Salinity Stress,
W72-00562 2I

FOSTER, S.
Study of Unconventional Methods for Brine Concentration,
W72-00379 3A

FRANCO, JOHN F.
Navigation Conditions at Hannibal Locks and Dam, Ohio and West Virginia: Hydraulic Model Investigation,
W72-00373 8B

FRANCO, JOHN J.
Jones Bluff Lock and Dam, Alabama River Navigation Project: Hydraulic Model Investigation,
W72-00359 8B

Navigation Conditions at Lock and Dam No. 3, Arkansas River, Arkansas and Oklahoma, Hydraulic Model Investigation,
W72-00362 8B

Navigation Conditions at Lock and Dam No. 7, Arkansas River: Hydraulic Model Investigation,
W72-00365 8B

Navigation Conditions in Fort Smith Reach, Arkansas River. Hydraulic Model Investigation,
W72-00360 8B

Webers Falls Lock and Dam, Arkansas River Navigation Project: Hydraulic Model Investigation,
W72-00347 8B

FREEMAN, R. A.
Constant Flow Delivery Device for Chronic Bioassay,
W72-00527 5A

FROELICH, P.
Organic Carbon in Sediments of the North Carolina Continental Rise,
W72-00092 2J

GACHECHILADZE, G. A.
Design of a Circular Hydraulic Jump,
W72-00074 8B

GAMBLE, E. E.
Stability of Coastal Plain Surfaces,
W72-00091 2J

GANGOPADHYAYA, M.
On the Global Solar Radiation Climate and Evapotranspiration Estimates in India,
W72-00180 2D

GANNON, J. J.
A Field Study of Inorganic Nitrogen Oxidation Rates,
W72-00018 5B

GARBER, WILLIAM F.
Operational and Maintenance Experience In Screening Digested Sludge,

W72-00044 5D

GARCEAU, H. S.
Operation of a Treatment Works Handling the Wastes from the Processing of Truck Bodies,
W72-00026 5D

GATES, W. E.
Chlorinated Hydrocarbons: Emerging Implications in Regional Planning,
W72-00038 5B

GEORGE, C. J.
On the Global Solar Radiation Climate and Evapotranspiration Estimates in India,
W72-00180 2D

GERACI, J. R.
Veterinary Medicine in the Conservation and Management of Marine Mammal Resources,
W72-00539 2I

GIBBONS, C. L.
A Procedure for Tracing of Kraft Mill Effluent from an Ocean Outfall by Constituent Fluorescence,
W72-00123 5B

GILBERT, J. B.
Control of Estuarine Pollution,
W72-00290 6E

GILLILAND, B. E.
Water Resource Pollutant Identification by Digital Computer Analysis of Remote Infrared Sensor Spectral Intensities,
W72-00305 5A

GINSBURG, H.
Model for Iso-Osmotic Water Flow in Plant Roots,
W72-00178 2I

GIULIANO, D. F.
Improved Discrete Depth Sampler,
W72-00093 7B

GLEESON, GEORGE W.
Attitudes, Assessments, and Action,
W72-00013 5G

GLEN, J. W.
The Mechanical Properties of Single Crystals of Pure Ice,
W72-00336 2C

GLOVER, JAMES E.
Jones Bluff Lock and Dam, Alabama River Navigation Project: Hydraulic Model Investigation,
W72-00359 8B

Navigation Conditions at Hannibal Locks and Dam, Ohio and West Virginia: Hydraulic Model Investigation,
W72-00373 8B

Webers Falls Lock and Dam, Arkansas River Navigation Project: Hydraulic Model Investigation,
W72-00347 8B

GODDARD, J. E.
Flood-Plain Management Must Be Ecologically And Economically Sound,
W72-00117 2E

GODFREY, P. J.
A Comparative Assessment of Pollution's Effect on the Benthic Macroinvertebrates of the Millers River, Massachusetts Using Factor Analysis, Diversity, Indices and Cluster Analysis of Similarity Coefficients,
W72-00136 5C

GODWIN, L. H.
Classification of Public Lands Valuable for Geothermal Steam and Associated Geothermal Resources,
W72-00096 2F

GOLDEN, B.
Organic Carbon in Sediments of the North Carolina Continental Rise,
W72-00092 2J

GOLDIE, L. F. E.
Amenities Rights--Parallels to Pollution Taxes,
W72-00192 5G

Principles of Responsibility in International Law,
W72-00251 6E

GOLDMAN, E.
Studies of Municipal Wastewater Renovation For Industrial Water,
W72-00045 5D

GOLDMAN, M. I.
Controlling Pollution: The Economics of a Cleaner America,
W72-00459 5G

What is Pollution,
W72-00462 5G

GOLUBEV, V. S.
Accurate Measurement of Atmospheric Precipitation by the Tret'yakov Precipitation Gage (O korrektnom izmerenii atmosfernykh osadkov osadkomerom Tret'yakova),
W72-00066 2B

Effect of Precipitation and Evaporation on Changes in Solution Concentration (Vliyaniye dozhdey i ispareniya na izmeneniye kontsentratsii rastvorov),
W72-00064 5B

GOLZE, A. R.
Model Law to Improve Dam Safety,
W72-00073 6E

GOODMAN, A. S.
Streamflow Routing for Water Pollution Studies,
W72-00124 5G

GORDEN, EDWARD
Louisiana (Analysis of State's Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00489 6E

GORDON, EDWARD
Arkansas (Analysis and Comparison with Tennessee Water Pollution Law),
W72-00480 6E

Hawaii (Analysis and Comparison with Present and Proposed Tennessee Water Pollution Law),
W72-00484 6E

Nebraska (Analysis of State's Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00497 6E

GOW, A. J.
On the Rates of Growth of Grains and Crystals in South Polar Firn,
W72-00329 2C

GRACE, JOHN L. JR
Mechanics of Flow from Stratified Reservoirs in the Interest of Water Quality: Hydraulic Laboratory Investigation,
W72-00361 5F

GRAHAM, J. L.
Pollutants Leached from Selected Species of Wood in Log Storage Waters,
W72-00019 5B

GRAY, D. M.
Unlined Mole Lines for Irrigation,
W72-00545 3F

GRAY, O. S.
Cases and Materials on Environmental Law,
W72-00456 6E

GRAY, T. C.
Dehydration and Water Intoxication of Range Cattle,
W72-00536 5C

GREEN, C. R.
Summer Rainfall over the Santa Catalina Mountains,
W72-00168 2B

GREEN, H. P.
Radioactive Waste and the Environment,
W72-00193 5B

GREENWALD, A. G.
Lawyers as Human Environmentalists Advocate's Environmental Advice,
W72-00252 6E

GREYSER, YE. L.
Role of Artesian Water in the Formation of Streamflow as Illustrated by the Tosna River (Otsenka roli napornykh podzemnykh vod v formirovanii rechnogo stoka na primere r. Tosny),
W72-00321 2F

GRIEVES, R. B.
Precipitate Flotation of Complexed Cyanide,
W72-00029 5D

GRIFFIN, D. M.
Effect of Soil Moisture and Aeration on Fungal Activity, an Introduction,
W72-00555 5C

GRIFFITH, C. C.
BOD From Poultry Processing Plants,
W72-00444 5D

GRIORIANTS, E. A.
Study of Natural Stress Distribution in Rock Massifs with the Help of Seismic-acoustic methods,
W72-00079 8E

GROSSMAN, I.
Impact of Stream Assimilation Capacity on Waste Treatment Requirements,
W72-00432 5C

GROVE, C. S. JR
DESIGN OF A TREATMENT PLANT FOR BAKERY WASTES,
W72-00021 5D

Rehabilitation of Solid Industrial Wastes Disposal Sites,
W72-00031 5E

GUNDERLOY, FRANK C. JR
Development of a Chemical Denitrification Process,

GUNDERLOY, FRANK C. JR

W72-00001 5D

GURNHAM, C. F.
Projected Wastewater Treatment Costs in the Organic Chemicals Industry,
W72-00028 5D

GUTELMACHER, B. L.
The Use of Radioactive Carbon Method in Studies of Trophic Relationships of Plankton (Primenenie radiouglerodnogo metoda dlya isucheniya troficheskikh vzaimootnoshenii v planktone),
W72-00161 5C

HAIGLER, L. B.
Classification of Public Lands Valuable for Geothermal Steam and Associated Geothermal Resources,
W72-00096 2F

HALASI-KUN, G. J.
International Developments In Water Pollution Control: Principles Of Responsibility: Continental Europe,
W72-00234 5G

HALDI, J.
Applications of Program Budgeting to Environmental Problems,
W72-00391 6B

HAMILTON, L. S.
Impacts of Nuclear Power Plants on the Environment,
W72-00534 5C

HARDIE, MICHAEL G.
Treatment of Refinery Wastes by Physico Chemical Processes,
W72-00005 5D

HARDY, H. R. JR
An Automated Test Facility for Rock Mechanics Research,
W72-00344 8E

HARGRAVE, J. A.
Oil Pollution Problems on the Pacific Coast,
W72-00281 5G

HARIDASAN, M.
Effect of Temperature on Pressure Head-water Content Relationship and Conductivity of Two Soils,
W72-00312 2G

HARP, JIM F.
Evaluation of Dispersed Pollutional Loads from Urban Areas,
W72-00355 5B

HARRIS, D. D.
Streamflow, Sediment-Transport, And Water-Temperature Characteristics Of Three Small Watersheds In The Alsea River Basin, Oregon,
W72-00115 2E

HARRIS, D. LEE
Analysis of Wave Records,
W72-00350 7B

Comparison of Pressure and Staff Wave Gage Records,
W72-00352 7B

HARTENSTEIN, ALAN G.
Anaerobic Digestion of Sludges Containing Iron Phosphates,
W72-00414 5D

HAYES, M. L.
A New Process For Recovery of By-products From Shellfish Waste,
W72-00025 5D

HAZELTON, J. E.
Effluents and Affluence,
W72-00464 5G

HEALY, N. J.
The 1969 Brussels Convention On Civil Liability For Oil Pollution,
W72-00238 5G

HEATON, JON
Nevada (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00498 6E

New Mexico (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00501 6E

Utah (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00511 6E

HEERMANN, D. F.
Pressure Distribution on a Center-pivot Sprinkler Irrigation System,
W72-00078 8B

HELLMUTH, E. O.
Eco-Physiological Studies on Plants in Arid and Semi-Arid Regions in Western Australia. III. Comparative Studies of Photosynthesis, Respiration and Water Relations of Ten Arid Zone Plants Under Winter and Late Summer Climatic Conditions,
W72-00176 2I

HEMPHILL, L.
Method of a New Differential Thermal Analysis,
W72-00030 5A

HEYERDAHL, T.
Atlantic Ocean Pollution and Biota Observed by the 'RA' Expeditions,
W72-00147 5C

HIGHTOWER, F. JR
Apparatus for Controlling Ambient Light Cycles in Experimental Environments,
W72-00525 7B

HILL, D. W.
Discussion of 'BOD From Poultry Processing Plants',
W72-00445 5D

HOBBS, C. H. III
Shoreline Orientation and Storm Surge,
W72-00132 2J

HOFF, J. G.
Some Aspects of the Hydrography of a Relatively Unpolluted Estuary in Southeastern Massachusetts,
W72-00431 5C

HOGGAN, D. H.
The Money Gap - Can States Fill It,
W72-00396 6C

HOLBO, H. R.
Development of a Stability Correction for Estimating Convective Transfer,
W72-00316 2B

HOLDSWORTH, G.
Flexure of a Floating Ice Tongue,
W72-00330 2C

HOLLER, A. G.
Reaeration through Low Dams in the Ohio River,
W72-00032 5G

HOLTZMANN, S.
Effect of Environmental Salinity on the Incorporation of Tritiated Leucine in Gills of a Fresh Water Teleost Xiphophorus-Maculatus,
W72-00563 5C

HORN, M. E.
Estimating Soil Permeability Rates,
W72-00345 2G

HOURRIGAN, J. L.
Safe Use of Pesticides on Livestock,
W72-00538 5G

HOWE, A. B.
Biological Investigation of Atlantic Tomcod, Microgadus Tomcod (Walbaum), in the Weweantic River Estuary, Massachusetts, 1967,
W72-00139 5C

HOWE, C. W.
Interbasin Transfers: Do We Need Them,
W72-00402 6D

HUANG, JU-CHANG
Treatment of Refinery Wastes by Physico Chemical Processes,
W72-00005 5D

HUGGINS, L. F.
Effect of Rainfall on the Resistance in Channels with Shallow Flow,
W72-00307 8B

HURD, E. A.
70 Years with Wheat-M in Kenya,
W72-00554 3F

HYATT, M. LEON
Computer Simulation of the Hydrologic-Salinity Flow System within the Upper Colorado River Basin,
W72-00084 7C

INGEBO, P. A.
Suppression of Channel-Side Chaparral Cover Increases Streamflow,
W72-00054 4A

INGRAM, H.
Patterns of Politics in Water Resources Development,
W72-00075 6E

IRVINE, ROBERT L.
Kinetic Aanalysis of Data from Biological Systems,
W72-00007 5D

ISAACS, W. P.
An Experimental Study of the Effect of Channel Surface Roughness on the Reaeration Rate Coefficient,

W72-00039 5G

ISHIZAKI, CHANEL
Adsorption of Sulfur Containing Taste and Odor Compounds on Activated Carbon,
W72-00423 5D

ISRAELSON, EUGENE K.
Computer Simulation of the Hydrologic-Salinity Flow System within the Upper Colorado River Basin,
W72-00084 7C

JACOBI, G. Z.
A Quantitative Artificial Substrate Sampler for Benthic Macro Invertebrates,
W72-00528 5C

JACOBSON, R. N.
Study of Unconventional Methods for Brine Concentration,
W72-00379 3A

JANICKI, R.
DDT Inhibition of Intestinal Salt and Water Absorption in Teleosts,
W72-00566 5C

JANIS, J. R.
REMOVAL OF WHITE WATER EFFLUENT TURBIDITY BY BIOLOGICAL TREATMENT PROCESSES,
W72-00022 5D

JARASHOW, RICHARD
Federal Water Pollution Control Act,
W72-00518 6E

New York (Analysis of State's Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00502 6E

Oklahoma (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00505 6E

Pennsylvania (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00507 6E

JEMISON, GEORGE M.
The Forest Environment--Problems and Promises,
W72-00010 6D

JENSEN, L. D.
Effects on Freshwater Microfauna,
W72-00152 5C

JOHNSON, E. L.
A New Process For Recovery of By-products From Shellfish Waste,
W72-00025 5D

JOHNSON, ROBERT L.
Treatment of Wastewaters by Pulsed Adsorption Beds,
W72-00425 5D

JOHNSTONE, D. L.
Investigation of Techniques to Provide Advance Warning of Ground-water Pollution Hazards with Special Reference to Aquifers in Glacial Outwash,
W72-00358 5B

JONES, L. JR
Tort Liability and the Oil and Gas Industry,
W72-00257 5G

JONES, S. J.
The Mechanical Properties of Single Crystals of Pure Ice,
W72-00336 2C

JOOST, R. H.
Systemation in Using the Rotating Biological Surface (RBS) Waste Treatment Process,
W72-00435 5D

KANE, JOHN K.
Combined Sewer Overflow Abatement Alternatives: Washington, D.C.,
W72-00082 5D

KARSCHON, R.
The Effect of Air Temperature and Moisture Stress Upon Leaf Surface Temperatures of Calotropis Procera (Willd.) R. Br.,
W72-00183 2I

KASHYAP, R. L.
Stochastic Difference Equation Modelling of Hydrologic Processes,
W72-00306 2A

KAUL, R. N.
Range Ecology at the Institute,
W72-00166 3F

KAWAKATSU, M.
Further Studies on the Vertical Distribution of Fresh Water Planarians in the Japanese Islands,
W72-00570 2I

KAWATA, KAZUYOSHI
Inactivation of Virus in Sewage,
W72-00412 5D

KAWATSKI, J. A.
Epoxidation of Aldrin by a Freshwater Ostracod,
W72-00548 5C

KEELER, C. M.
The Growth of Bonds and the Increase of Mechanical Strength in a Dry Seasonal Snow-Pack,
W72-00334 2C

KEENER, K. C.
Federal Water Pollution Legislation and Regulations with Particular Reference to the Oil Industry,
W72-00255 5G

KEETON, P.
Tort Liability and the Oil and Gas Industry,
W72-00257 5G

KEHRBERGER, G. J.
A Critical Review of BOD Analysis Using Respirometer Techniques,
W72-00036 5A

KEITH, F. W.
Centrifuges in Water and Waste Treatment,
W72-00016 5D

KEMP, P. H.
Chemistry of Natural waters - III Carbonic Acid,
W72-00127 5A

KENNEDY, B. A.
Periglacial Morphometry,
W72-00111 2C

KESTNER, M. L.
Rehabilitation of Solid Industrial Wastes Disposal Sites,
W72-00031 5E

KEYES, M. C.
Veterinary Medicine in the Conservation and Management of Marine Mammal Resources,
W72-00539 2I

KHAN, H. R.
Experimental Study Of Channel Patterns,
W72-00119 2E

KIMBLE, E. J. JR
An Automated Test Facility for Rock Mechanics Research,
W72-00344 8E

KINCAID, D. C.
Pressure Distribution on a Center-pivot Sprinkler Irrigation System,
W72-00078 8B

KING, P. H.
Effects of Reservoir Operating Policy on Recreation Benefits,
W72-00399 4A

The Hydraulic Performance of Chlorine Contact Tanks,
W72-00448 5D

KINTER, W.
DDT Inhibition of Intestinal Salt and Water Absorption in Teleosts,
W72-00566 5C

KIRKBY, M. J.
Erosion by Water on Hillslopes,
W72-00106 2J

Infiltration, Throughflow, And Overland Flow,
W72-00105 2G

KLASSEN, C. W.
The Water Pollution Control Agency: Legas Basis, Administration Regulations And Staffing,
W72-00221 5G

KLEEREKOPER, H.
Interference with a Memory Process by DDT in Goldfish,
W72-00567 5C

KNAGGS, F. W.
Some Ecological Effects on the Use of Paraquat for the Control of Weeds in Small Lakes,
W72-00155 4A

KOLESOV, G. P.
Role of Artesian Water in the Formation of Streamflow as Illustrated by the Tosna River (Otsenka roli napornykh podzemnykh vod v formirovanii rechnogo stoka na primere r. Tosny),
W72-00321 2F

KOPTEV, V. I.
Study of Natural Stress Distribution in Rock Massifs with the Help of Seismic-acoustic methods,
W72-00079 8E

KORCHOKHA, YU. M.
Study of the Geometry of Sand Dunes and Estimation of Bottom Sediment Discharge (Issledovaniye geometricheskikh kharakteristik peschanykh gryad i otsenka raskhoda donnykh nanosov),

KORCHOKHA, YU. M.

W72-00069 2J

KOTT, YEHUDA
Chlorination Dynamics in Wastewater Effluents,
W72-00422 5D

KRAMER, GARY R.
Hydrolysis of Lipids in Wastewater,
W72-00421 5D

KRIZ, G. J.
Ditch Drainage of Anisotropic Nonhomogeneous Porous Media: A Model Study,
W72-00309 2G

KUDELIN, B. I.
The Freshwater-Supply Problems of Mankind,
W72-00187 2A

KUMAR, H. D.
Toxicity of Selenium to the Blue-Green Algae, Anacystis Nidulans and Anabaena Variabilis,
W72-00153 5C

KUNIN, V. N.
The Freshwater-Supply Problems of Mankind,
W72-00187 2A

KUSHINS, L. J.
Responses of Inter Tidal Invertebrates to Low Oxygen Conditions,
W72-00558 5C

KUZNETSOV, V. I.
Characteristics of Evaporation from Industrial Wastes (Osobennosti ispareniya s promyshlennykh stokov),
W72-00063 5B

Procedures for Computing Evaporation from 20-Square-Meter Evaporation Pans Based on Observations in GGI-3,000 Evaporimeters (Metodika rascheta ispareniya s basseynov ploshchad'yu 20 m2 po nablyudeniyam v isparitelyakh GGI-3,000),
W72-00062 2D

LANDIS, D. M.
Process Control of Centrifuge Operations,
W72-00017 5D

LANDSBERG, H. H.
International Environmental Problems--A Taxonomy,
W72-00384 5C

LANGLEBEN, M. P.
Albedo and Degree of Puddling of a Melting Cover of Sea Ice,
W72-00331 2C

LASKA, LEWIS
Alaska (Analysis and Comparison with Tennessee Water Law),
W72-00478 6E

Oregon (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00506 6E

Washington (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00514 6E

LAWRENCE, R.
The Challenge of Environmental Quality: An Outline of Remedies to Meet It,
W72-00270 5G

LEE, JAMES A.
Combined Sewer Overflow Abatement Alternatives: Washington, D.C.,
W72-00082 5D

LEONARD, E. N.
Effects of Copper on Gammarus Pseudolimnaeus, Physa Integra, and Campeloma Decisum in Soft Water,
W72-00148 5C

LEONARD, ROBERT
Iowa (Analysis and Comparison with Present and Proposed Tennessee Water Pollution Law),
W72-00486 6E

Ohio (Analysis of State's Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00504 6E

LEONTE, E.
Comparative Study of the Oxygen Consumption in Ctenopharyngodon Idella and Hypophthalmichthys Molitrix Embryos and Larvae - First Stages, (Cercetari Asupra Metabolimului Energetic la Speciile Ctenopharyngodon Idella si Hypophthalmichthys Molitrix in Stadiile Embrionare si in Primele Stadii Larvare),
W72-00145 5C

The Influence of Oxygen Concentration on Routine Metabolism of Cyprinus Carpio L. in Different Temperature Conditions, (Influenta Concentratiei de Oxigen Asupra Metabolismului Energetic la Cyprinus Carpio L. in Diferite Conditii de Temperatura),
W72-00144 5C

LESTER, A.
River Pollution in International Law,
W72-00450 5G

LEVENDUSKY, J. A.
The Graver C.I. Process Continuous Countercurrent Filtration and Adsorption,
W72-00040 5D

LIGON, J. T.
Distribution of Moisture in the Unsaturated Profile on a Piedmont Watershed,
W72-00308 2G

Measurement of Interflow and Deep Seepage on Piedmont Watersheds,
W72-00311 2G

LIKE, I.
Multi-Media Confrontation--The Environmentalist's Strategy for a 'No-Win' Agency Proceeding,
W72-00286 5G

LITOVITZ, T. A.
Light Scattering and Ultrasonic Investigations of Relaxation in Aqueous Solutions,
W72-00378 1A

LITTLE, T. H.
Centrifuges in Water and Waste Treatment,
W72-00016 5D

LIU, L.
Clarification of the Lime Bearing Wastes from a Sole Leather Tannery,
W72-00434 5D

LLIBOUTRY, L.
The Dynamics of Temperature Glaciers from the Detailed Viewpoint,
W72-00087 2C

LOMAS, J.
An Agro Meteorological Method of Forecasting the Appearance of Grapevine-D Downy Mildew Plasmopara-Viticola in Israel,
W72-00553 3F

LONDONG, D.
Purification of Wastes From a German Yeast Plant,
W72-00446 5D

LUCE, C. F.
Power for Tomorrow: The Siting Dilemma,
W72-00269 5G

L'VOVICH, M. I.
The Freshwater-Supply Problems of Mankind,
W72-00187 2A

MACE, A. C. JR
Osmotic Water Stress: Mesophyll Saturation Deficit and Transpiration Rates of Tamarisk,
W72-00172 2D

MADSEN, O. S.
Waves Generated by Piston-Type Wavemaker,
W72-00351 8B

MAHIDA, VIJAYSINH U.
Combined Wastewater Collection And Treatment Facility, Mount Clemens, Michigan,
W72-00042 5D

MALHOTRA, SUDERSHANK
Anaerobic Digestion of Sludges Containing Iron Phosphates,
W72-00414 5D

MALONEY, F. E.
New York (Analysis of State's Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00502 6E

Tennessee Water Quality Control Act of 1971 with Commentary,
W72-00476 6E

MALONEY, FRANK E.
The 1971 Water Pollution Study for the State of Tennessee,
W72-00475 6E

Alabama (Analysis and Comparison with Tennessee Water Pollution Control Law),
W72-00477 6E

Alaska (Analysis and Comparison with Tennessee Water Law),
W72-00478 6E

Annual User Surveillance Fee,
W72-00520 6E

Arizona (Analysis and Comparison with Tennessee Water Pollution Control Law),
W72-00479 6E

Arkansas (Analysis and Comparison with Tennessee Water Pollution Law),
W72-00480 6E

California (Analysis and Comparison with Tennessee Water Pollution Law),
W72-00481 6E

Colorado (Analysis and Comparison with Tennessee Water Pollution Law),
W72-00482 6E

Federal Water Pollution Control Act,
W72-00518 6E

Florida (Analysis and Comparison with Present and Proposed Tennessee Water Pollution Law),

W72-00483 6E

Hawaii (Analysis and Comparison with Present and Proposed Tennessee Water Pollution Law),
W72-00484 6E

Indiana (Analysis and Comparison with Tennessee Water Pollution Law),
W72-00485 6E

Iowa (Analysis and Comparison with Present and Proposed Tennessee Water Pollution Law),
W72-00486 6E

Kansas (Analysis and Comparison of Kansas and Tennessee Water Pollution Law),
W72-00487 6E

Kentucky (Analysis and Comparison with Present and Proposed Tennessee Water Pollution Law),
W72-00488 6E

Louisiana (Analysis of State's Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00489 6E

Maine (Analysis of State's Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00490 6E

Maryland (Analysis of Maryland Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00491 6E

Massachusetts (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00492 6E

Michigan (Analysis of Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00493 6E

Minnesota (Analysis of State's Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00494 6E

Mississippi (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00495 6E

Montana (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00496 6E

Nebraska (Analysis of State's Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00497 6E

Nevada (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00498 6E

New Hampshire (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00499 6E

New Jersey (Analysis of State's Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00500 6E

New Mexico (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00501 6E

North Dakota (Analysis of State's Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00503 6E

Ohio (Analysis of State's Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00504 6E

Oklahoma (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00505 6E

Oregon (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00506 6E

Pennsylvania (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00507 6E

Rhode Island (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00508 6E

South Carolina (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00509 6E

South Dakota (Analysis of State's Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00510 6E

Supplement to Federal Program Sections,
W72-00519 6E

Utah (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00511 6E

Vermont (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00512 6E

Virginia (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00513 6E

Washington (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00514 6E

West Virginia (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00515 6E

Wisconsin (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00516 6E

Wyoming (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00517 6E

MANCY, K. H.
The Effect of Surface Active Agents on Substrate Utilization in an Experimental Activated Sludge System,
W72-00035 5D

MANCZAK, H.
Interpretation of Results from the Studies of Pollution of Surface Flowing Waters,
W72-00125 5A

MANGES, H. L.
Clarification Of Turbid Water By Filter Fabrics,
W72-00120 5G

MANGUM, G. P.
Responses of Inter Tidal Invertebrates to Low Oxygen Conditions,
W72-00558 5C

MANN, L. A.
Biological--Gamma-Radiation System for Sewage Processing,
W72-00383 5D

MANNER, E. J.
Water Pollution In International Law,
W72-00223 5G

MARINESCU, AL. G.
The Influence of Oxygen Concentration on Routine Metabolism of Cyprinus Carpio L. in Different Temperature Conditions, (Influenta Concentratiei de Oxigen Asupra Metabolismului Energetic la Cyprinus Carpio L. in Diferite Conditii de Temperatura),
W72-00144 5C

MARTIN, D. F.
Effect of Humic Acids on Iron Analyses in Natural Waters,
W72-00315 2K

MARTIN, D. W.
Separation of Taxonomically Identifiable Organisms and Detritus Taken from Shad Foregut Contents Using Density Gradient Centrifugation, 1970, Prosobranchia Muricidae,
W72-00529 2I

MARTIN, J. R.
Occurrence of Juvenile Snook Centropomus-Undecimalis in North-Carolina Waters,
W72-00526 2I

MAYLATH, RONALD E.
New York's Water Quality Surveillance Program,
W72-00424 5G

MCALBON, T. J.
Chemical Conditioning of Biological Sludges for Vacuum Filtration,
W72-00037 5D

MCCANN, S. B.
Beach Processes and Shoreline Changes, Kouchibouguac Bay, New Brunswick,
W72-00133 2L

MCCLELLAN, J. C.
Hydraulic and Process Aspects of Reactor Design, II-Response to Variations,

MCCLELLAN, J. C.

W72-00439 5D

MCCLELLAND, N. I.
The Effect of Surface Active Agents on Substrate Utilization in an Experimental Activated Sludge System,
W72-00035 5D

MCCLOSKEY, P. N. JR
The Legal Profession's Leadership in Rebuilding Environmental Quality,
W72-00472 6E

MCCULLOCH, W. F.
Environmental Health and Ecology: Old Concepts with New Meaning for Mans Survival,
W72-00535 5G

MCDANIEL, JAMES
Arizona (Analysis and Comparison with Tennessee Water Pollution Control Law),
W72-00479 6E

Colorado (Analysis and Comparison with Tennessee Water Pollution Law),
W72-00482 6E

Florida (Analysis and Comparison with Present and Proposed Tennessee Water Pollution Law),
W72-00483 6E

Wyoming (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00517 6E

MCGILL, D. A.
Some Aspects of the Hydrography of a Relatively Unpolluted Estuary in Southeastern Massachusetts,
W72-00431 5C

MCGUINNESS, W. V. JR
A Return to the Coast,
W72-00393 2L

MCKEE, M. LYNN
Computer Simulation of the Hydrologic-Salinity Flow System within the Upper Colorado River Basin,
W72-00084 7C

MCKELLAR, CODY D.
Navigation Conditions at Lock and Dam No. 3, Arkansas River, Arkansas and Oklahoma, Hydraulic Model Investigation,
W72-00362 8B

Navigation Conditions at Lock and Dam No. 7, Arkansas River: Hydraulic Model Investigation,
W72-00365 8B

MCKENZIE, G. D.
Observations on a Collapsing Kame Terrace in Glacier Bay National Monument, South-Eastern Alaska,
W72-00332 2C

MEEHAN, W. R.
Residues in Fish, Wildlife, and Estuaries,
W72-00122 5B

MELSHEIMER, EDWIN S.
Outlet Works for Beltzville Dam, Pohopoco Creek, Pennsylvania: Hydraulic Model Investigation,
W72-00369 8B

Outlet Works for New Hope Reservoir Cape Fear River Basin, North Carolina: Hydraulic Model Investigation,
W72-00371 8B

MELTON, BERTRAND K.
Jones Bluff Lock and Dam, Alabama River Navigation Project: Hydraulic Model Investigation,
W72-00359 8B

MERCER, WALTER A.
Reduction of Salt Content of Food Processing Liquid Waste Effluent,
W72-00409 5D

MIDGLEY, D. C.
Appraisal and Management of Water Resources in South Africa,
W72-00186 6B

MILEHAM, WILLIAM
Kansas (Analysis and Comparison of Kansas and Tennessee Water Pollution Law),
W72-00487 6E

Michigan (Analysis of Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00493 6E

New Hampshire (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00499 6E

MILLER, W.
Positive Incentives And Negative Controls,
W72-00240 5G

MILLER, WILLIAM D.
Infiltration Rates and Groundwater Quality Beneath Cattle Feedlots, Texas High Plains,
W72-00083 5B

MILOVANOVIC, D.
A 1 Year Study of Primary Production in Lake Skadar,
W72-00532 2H

MINNICH, J. E.
Water Turnover in the Mohave Sand Lizard Umascoparia,
W72-00560 2I

MOORE, N. W.
Some Ecological Effects on the Use of Paraquat for the Control of Weeds in Small Lakes,
W72-00155 4A

MORGAN, J. M.
Effects of Reservoir Operating Policy on Recreation Benefits,
W72-00399 4A

MORISAWA, M.
Evaluation of Natural River Environments: Phase II,
W72-00357 6B

MOULTON, F.
Possible Liabilities Arising from Violations of Conservation Orders,
W72-00220 6E

MOULTON, J. C.
The Fishery Potential of Four Aquatic Environments Created by Interstate Route 91 Construction in Massachusetts,
W72-00135 4C

MT, R. C.
Impact of Stream Assimilation Capacity on Waste Treatment Requirements,
W72-00432 5C

MT, RUSSEL C.
Implications of Nitrogenous BOD in Treatment Plant Design,
W72-00420 5D

MUFFLER, L. J. P.
Classification of Public Lands Valuable for Geothermal Steam and Associated Geothermal Resources,
W72-00096 2F

MUKERJEE, A.
Gas Absorption in a Heterogeneous System,
W72-00085 5A

MURPHY, T. E.
Ansonia-Derby Local Protection Project, Naugatuck and Housatonic Rivers, Connecticut: Hydraulic Model Investigation,
W72-00368 8B

MUSKIE, E. S.
Introduction of a Bill to Amend the Clean Air Act and the Federal Water Pollution Control Act,
W72-00241 6E

NAGIBINA, T.
Water Pollution Control In The USSR And Eastern European Countries,
W72-00222 5G

NAGY, K. A.
Water and Electrolyte Budgets in a Field Population of the Desert Lizard Sauromalus-Obesus,
W72-00559 2I

NEMEROW, N. L.
Rehabilitation of Solid Industrial Wastes Disposal Sites,
W72-00031 5E

NEUBERGER, E. D.
New Applications of On-stream Analysers in Pulp Mills,
W72-00009 5A

NEWMAN, J. F.
Some Ecological Effects on the Use of Paraquat for the Control of Weeds in Small Lakes,
W72-00155 4A

NICHOLS, H. WAYNE
Environmental Control of Growth and Differentiation in Multicellular Photosynthetics,
W72-00377 5B

NICOLL, D. E.
Positive Incentives And Negative Controls,
W72-00239 5G

NILES, DAVID G.
Studies of Municipal Wastewater Renovation For Industrial Water,
W72-00045 5D

NORUM, D. I.
Unlined Mole Lines for Irrigation,
W72-00545 3F

OAKES, D. L. T.
Nelson River HVDC Transmission Line Towers,
W72-00339 8C

OKAMOTO, T.
Horizontal HCl Pickling Line at Fukuyama,
W72-00004 5D

OLDSHUE, J. Y.
The Case for Deep Aeration Tanks,

W72-00015 5D

OLIVIERI, VINCENT P.
Inactivation of Virus in Sewage,
W72-00412 5D

OSEID, D. M.
Survival and Hatching of Walleye Eggs at Various Dissolved Oxygen Levels,
W72-00142 5C

OSWALT, N. R.
Outlet Works for New Hope Reservoir Cape Fear River Basin, North Carolina: Hydraulic Model Investigation,
W72-00371 8B

OZERETSKOVSKAYA, N. G.
The Use of Radioactive Carbon Method in Studies of Trophic Relationships of Plankton (Primenenie radiouglerodnogo metoda dlya isucheniya troficheskikh vzaimootnoshenii v planktone),
W72-00161 5C

PAGE-JONES, R. M.
The Automatic Detection of Low Levels of Dissolved Free Chlorine in Fish Farming Experiments Using Seawater Effluents,
W72-00141 5C

PAILTHORP, ROBERT E.
Industrial Effluents of the Northwest,
W72-00427 5G

PALMER, H. D.
Some Simple Devices for the Study of Wave Induced Surges,
W72-00056 2E

PALTI, J.
Forecasting Downy Mildews and Late Blight in Israel,
W72-00549 3F

PAPENDICK, R. I.
Effect of Soil Water on Microbial Growth Antagonism and Nutrient Availability in Relation to Soil-Borne Fungal Diseases of Plants,
W72-00556 5C

PAPPO, S.
Overhead Irrigation of Apple-D Orchards as a Factor in Epidemic Development of Bitter Rot Gloeosporium-Fructigenum,
W72-00550 3F

PARRILO, THOMAS P.
Anaerobic Digestion of Sludges Containing Iron Phosphates,
W72-00414 5D

PATTERSON, J. W.
Sludge Activity Parameters and Their Application to Toxicity Measurements and Activated Sludge,
W72-00020 5D

PAVLOVA, K. K.
Thermodynamics and Composition of the Liquid Water Phase in Frozen Peat with Application to Infiltration Studies (K voprosu o faxovom sostave vody i teplofizicheskikh kharakteristikakh merzlogo torfa pri izuchenii infil' tratsii),
W72-00327 2F

PAVONI, JOSEPH L.
Disinfection of Algal Laden Waters,
W72-00411 5D

PELLETIER, B. R.
Sedimentological Sampling and Results from the Diver Lock-out Facility of the Submersible Shelf Diver, Bay of Fundy, Nova Scotia,
W72-00131 2L

PENISTON, Q. P.
A New Process For Recovery of By-products From Shellfish Waste,
W72-00025 5D

PERKINS, H. C.
Seasonal Variations in the Food of Juvenile Herring in Coastal Waters of Maine.
W72-00523 2I

PETERSON, N.
The Challenge of Environmental Quality: An Outline of Remedies to Meet It,
W72-00270 5G

PHARAND, D.
Oil Pollution Control in the Canadian Arctic,
W72-00254 5G

PICKERING, G. A.
Spillway for Kaysinger Bluff Dam Osage River, Missouri, Hydraulic Model Investigation,
W72-00372 8B

PICKERING, GLENN A.
Ansonia-Derby Local Protection Project, Naugatuck and Housatonic Rivers, Connecticut: Hydraulic Model Investigation,
W72-00368 8B

PILKEY, O. H.
Organic Carbon in Sediments of the North Carolina Continental Rise,
W72-00092 2J

PINCHAS, L.
The Effect of Air Temperature and Moisture Stress Upon Leaf Surface Temperatures of Calotropis Procera (Willd.) R. Br.,
W72-00183 2I

PINE, ROLAND E.
Preliminary Investigation of the Low Dissolved Oxygen Concentrations that Exist in Long Lake Located Near Spokane, Washington,
W72-00156 5C

PINTO, F. F.
70 Years with Wheat-M in Kenya,
W72-00554 3F

PIOTROVSKIY, A. V.
Tentative Application of a Telethermometer for Measurement of Water-surface Temperature (Opyt primeneniya distantsionnoy ustanovki dlya izmereniya temperatury poverkhnosti vody),
W72-00070 2H

PLITKIN, G. A.
Surface and Subsurface Flow into Rivers of the West Siberian Plain (Poverkhnostnyy i podzemnyy pritok v reki Zapadno-Sibirskoy ravniny),
W72-00326 2F

POPOV, O. V.
Analysis of the Interaction of River and Subsurface Waters (Nekotoryye elementy analiza vzaimodeystviya rechnykh i podzemnykh vod),
W72-00320 2F

Studies of Subsurface Flow (Issledovaniya podzemnogo stoka),
W72-00319 2F

PORTER, J. W.
Studies of Municipal Wastewater Renovation For Industrial Water,
W72-00045 5D

POST, A.
Inventory of Glaciers in the North Cascades, Washington,
W72-00060 7C

PRADT, L. A.
Zimpro Wet Oxidation of Soda Pulping Liquors,
W72-00032 5D

PRAKASH, G.
Toxicity of Selenium to the Blue-Green Algae, Anacystis Nidulans and Anabaena Variabilis,
W72-00153 5C

PREUL, H. C.
Reaeration through Low Dams in the Ohio River,
W72-00032 5G

PROWSE, G. A.
Experimental Criteria for Studying Grass Carp Feeding in Relation to Weed Control,
W72-00163 4A

PRUITT, L. L.
Pigskin Tannery Waste,
W72-00024 5D

PURVER, J. M.
Landowner's Right to Relief Against Pollution of His Water Supply by Industrial or Commercial Waste,
W72-00452 6E

PURVES, W. J.
Investigation of Techniques to Provide Advance Warning of Ground-water Pollution Hazards with Special Reference to Aquifers in Glacial Outwash,
W72-00358 5B

PUTNAM, H. D.
Sludge Activity Parameters and Their Application to Toxicity Measurements and Activated Sludge,
W72-00020 5D

RALLS, JACK W.
Reduction of Salt Content of Food Processing Liquid Waste Effluent,
W72-00409 5D

RAMBOW, C. A.
SUBMARINE DISPOSAL OF INDUSTRIAL WASTE,
W72-00041 5E

RAO, R. A.
Characteristics and Filtering of Noise in Linear Hydrologic Systems,
W72-00310 2A

Linear Systems Analysis in Hydrology--The Transform approach, the Kernel Oscillations and the Effect of Noise,
W72-00317 2A

Stochastic Difference Equation Modelling of Hydrologic Processes,

RATNER, N. S.
W72-00306 2A

RATNER, N. S.
Accuracy of Field Hydrometric Work in Studying Subsurface Flow (Tochnost' ekspeditsionnykh gidrometricheskikh rabot pri izuchenii podzemnogo stoka),
W72-00322 2F

RAY, A. D.
Method of a New Differential Thermal Analysis,
W72-00030 5A

REID, GEORGE W.
Evaluation of Dispersed Pollutional Loads from Urban Areas,
W72-00355 5B

REILLY, P. B. JR
Coagulants for Waste Water Treatment,
W72-00014 5D

REISWIG, H. M.
Water Pumping Activity in Field Populations of Marine Demospongiae,
W72-00564 2I

RENN, C. E.
Experience in the Treatment and Re-use of Industrial Waste Waters,
W72-00027 5D

REUVENI, R.
Effect of Air Humidity on the Development of Powdery Mildew on Cucurbits-D,
W72-00551 3F

RICHARDSON, D.
Inventory of Glaciers in the North Cascades, Washington,
W72-00060 7C

RICKLES, R. N.
Manpower Requirements and Needs for Waste Water Treatment Facility Operation,
W72-00033 5D

RILEY, J. PAUL
Computer Simulation of the Hydrologic-Salinity Flow System within the Upper Colorado River Basin,
W72-00084 7C

RIORDAN, C.
Multistage Marginal Cost Model of Investment-Pricing Decisions: Application to Urban Water Supply Treatment Facilities,
W72-00386 6C

RIOUX, R. L.
Classification of Public Lands Valuable for Geothermal Steam and Associated Geothermal Resources,
W72-00096 2F

RITTER, W. F.
Flood Damage to Crops in Depression Areas of Northcentral Iowa,
W72-00542 3F

RIVERS, H. M.
New Applications of On-stream Analysers in Pulp Mills,
W72-00009 5A

ROBIE, R. B.
Control of Estuarine Pollution,
W72-00290 6E

ROBINS, JOHN D.
The Effects of Various Atmospheres on the Oxidation of Coal Mine Pyrites,
W72-00081 5G

ROBINSON, GEORGE D.
Global Environmental Monitoring,
W72-00162 5C

ROCHESTER, E. W. JR
Ditch Drainage of Anisotropic Nonhomogeneous Porous Media: A Model Study,
W72-00309 2G

RODEVICK, M. L.
BOD From Poultry Processing Plants,
W72-00444 5D

RODMAN, CLARKE A.
Bio-regenerated Activated Carbon Treatment of Textile Dye Wastewaters,
W72-00003 5D

ROESLER, J. F.
A Mathematical Model for a Trickling Filter,
W72-00442 5D

ROGOTSKIY, V. V.
Methods of Calculating Melt-water Percolation (Sposoby rascheta prosachivaniya talykh vod),
W72-00068 2G

ROOSELOT, F. L.
Inventory of Glaciers in the North Cascades, Washington,
W72-00060 7C

ROSE, J. D.
Clarification Of Turbid Water By Filter Fabrics,
W72-00120 5G

ROSENFIELD, ARNOLD
Kentucky (Analysis and Comparison with Present and Proposed Tennessee Water Pollution Law),
W72-00488 6E

South Dakota (Analysis of State's Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00510 6E

ROTEM, J.
Effect of Air Humidity on the Development of Powdery Mildew on Cucurbits-D,
W72-00551 3F

Trends in Epidemiological Research,
W72-00552 3F

RUSSELL, C. S.
International Environmental Problems--A Taxonomy,
W72-00384 5C

RYAN, JAMES G.
Combined Sewer Overflow Abatement Alternatives: Washington, D.C.,
W72-00082 5D

SAARINEN, T. F.
Public Perception of Environmental Quality in Tucson, Arizona,
W72-00174 5G

SADDLER, J. B.
Comparative Fatty-Acid Changes During the Rapid Growth of Trout in Salt Water Ponds,
W72-00557 2I

SAMAD, M. A.
Pakistan's Water Problems and the Law of International Rivers,
W72-00179 6E

SAMIDE, H. R.
Spring Breakup of the Delta River, Alaska,
W72-00094 2C

SANSON, J. N.
Annual Compilation and Analysis of Hydrologic Data for Elm Fork Trinity River, Trinity River Basin, Texas, 1969,
W72-00097 7C

SARGENT, T. N.
Discussion of 'BOD From Poultry Processing Plants',
W72-00445 5D

SASSAMAN, C.
Responses of Inter Tidal Invertebrates to Low Oxygen Conditions,
W72-00558 5C

SAUCIER, J. W.
Anaerobic Lagoons Versus Aerated Lagoons in the Treatment of Packing-House Wastes,
W72-00441 5D

SAVICH, A. I.
Study of Natural Stress Distribution in Rock Massifs with the Help of Seismic-acoustic methods,
W72-00079 8E

SAWABINI, C. T.
Design and Operation of a Triaxial, High-Temperature, High-Pressure Compaction Apparatus,
W72-00058 2J

SAWYER, C. M.
The Hydraulic Performance of Chlorine Contact Tanks,
W72-00448 5D

SAWYER, J. S.
Possible Effects of Human Activity on World Climate,
W72-00171 5C

SCHACHTER, O.
Goals And Strategies For Combating International Pollution,
W72-00235 5G

SCHAEZLER, D. J.
Kinetic and Stoichiometric Limitations of Phosphate in Pure and Mixed Bacterial Cultures,
W72-00440 5C

SCHAEZLER, DONALD J.
Kinetic Aanalysis of Data from Biological Systems,
W72-00007 5D

SCHAUMBURG, F. D.
Pollutants Leached from Selected Species of Wood in Log Storage Waters,
W72-00019 5B

SCHENKER, E.
The Great Lakes Container Dilemma,
W72-00385 6C

SCHLESINGER, E. F.
DESIGN OF A TREATMENT PLANT FOR BAKERY WASTES,

W72-00021 5D

SCHLICKENRIEDER, WARREN
Implications of Nitrogenous BOD in Treatment Plant Design,
W72-00420 5D

SCHMITZ, E. H.
Separation of Taxonomically Identifiable Organisms and Detritus Taken from Shad Foregut Contents Using Density Gradient Centrifugation, 1970, Prosobranchia Muricidae,
W72-00529 2I

SCHMULBACK, J. C.
Epoxidation of Aldrin by a Freshwater Ostracod,
W72-00548 5C

SCHREIBMAN, M. P.
Effect of Environmental Salinity on the Incorporation of Tritiated Leucine in Gills of a Fresh Water Teleost Xiphophorus-Maculatus,
W72-00563 5C

SCHUMACHER, R. W.
Influence of Several Species of Aquatic Plants on Dichlobenil Residues in Water,
W72-00137 5C

SCHUMM, S. A.
Experimental Study Of Channel Patterns,
W72-00119 2E

Geomorphic Implications of Climatic Changes,
W72-00114 2E

SEARS, H. S.
Residues in Fish, Wildlife, and Estuaries,
W72-00122 5B

SEIBENHENER, ALBERT R.
Coagulation Of Textile Dye Wastes,
W72-00050 5D

SELLECK, ROBERT E.
Problems in Obtaining Adequate Sewage Disinfection,
W72-00419 5D

SHEA, T. G.
Chlorinated Hydrocarbons: Emerging Implications in Regional Planning,
W72-00038 5B

SHERMAN, K.
Seasonal Variations in the Food of Juvenile Herring in Coastal Waters of Maine.
W72-00523 2I

SHEVIN, R. L.
Jurisdiction of the Trustees of the Internal Improvement Trust Fund,
W72-00250 6E

SHIH, CHIA S.
Combined Sewer Overflow Abatement Alternatives: Washington, D.C.,
W72-00082 5D

SHIPP, R. L.
Occurrence of Juvenile Snook Centropomus-Undecimalis in North-Carolina Waters,
W72-00526 2I

SHLEMON, R. J.
The Quaternary Deltaic and Channel System in the Central Great Valley, California,
W72-00177 2J

SHOEMAKER, V. H.
Water Turnover in the Mohave Sand Lizard Umascoparia,
W72-00560 2I

SHOOP, R.
What is Pollution,
W72-00462 5G

SHOWS, LOUIS J.
Navigation Conditions in Fort Smith Reach, Arkansas River. Hydraulic Model Investigation,
W72-00360 8B

SHUMWAY, D. L.
Dissolved Oxygen Requirements of Freshwater Fishes,
W72-00530 5C

SHUNNEY, EDWARD L.
Bio-regenerated Activated Carbon Treatment of Textile Dye Wastewaters,
W72-00003 5D

SIMMONS, E. L.
Method of a New Differential Thermal Analysis,
W72-00030 5A

SIMONS, D. B.
Open Channel Flow,
W72-00108 8B

SINGER, PHILIP C.
Disinfection of Algal Laden Waters,
W72-00411 5D

SIVE, D.
The Functions and Features of Private Litigation in the Growth of Environmental Law,
W72-00471 6E

SLAUGHTER, C. W.
Spring Breakup of the Delta River, Alaska,
W72-00094 2C

SLOTE, LAWRENCE
Development of Immobilized Enzyme Systems for Enhancement of Biological Waste Treatment Processes,
W72-00002 5D

SMITH, C. V.
The Use of Ultrafiltration Membranes for Activated Sludge Separation,
W72-00034 5D

SMITH, L. L. JR
Survival and Hatching of Walleye Eggs at Various Dissolved Oxygen Levels,
W72-00142 5C

SMITH, R.
A Mathematical Model for a Trickling Filter,
W72-00442 5D

SMITH, W. F.
Pollution Problems in the Petroleum Industry--Construction of and Compliance with Federal and State Laws,
W72-00455 5G

SODERQUIST, MICHAEL R.
Analysis of Food Processing Wastewaters,
W72-00011 5D

SOKOLOV, A. A.
The Freshwater-Supply Problems of Mankind,
W72-00187 2A

SOKOLOV, B. L.
Study of Ice-Lens Formation Patterns (Issledovaniye zakonomernostey formirovaniya naledey),
W72-00323 2F

SORENSEN, R. M.
A Method of Tracing Sediment Movement on the Texas Gulf Coast,
W72-00314 2J

SPEICZNY, THOMAS
South Carolina (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00509 6E

SPIECZNY, THOMAS
Montana (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00496 6E

New Jersey (Analysis of State's Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00500 6E

Wisconsin (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00516 6E

SPOHR, G.
Phosphate Removal by pH Controlled Lime Dosage,
W72-00415 5D

STADELMANN, PIUS
Nitrogen Cycle and Primary Production in Mesotrophic Lake Lucerne (Horwer Bay) and in Eutrophic Red Lake with Special Regard to Nitrates as Limiting Factors (Stickstoff-Kreislauf und Primaproduktion im Mesotrophen Vier-Waldstattrsee (Horwer Bucht) und im Eutrophen Rotsee, mit Besonderer Berucksichtigung des Nitrats als Limitierenden Faktors),
W72-00158 5C

STAIRS, C. M.
Development of an HVDC Solid State Back to Back Asynchronous Tie,
W72-00338 8C

STEFANO, R.
An Automated Test Facility for Rock Mechanics Research,
W72-00344 8E

STEVENS, DONALD B.
New York's Water Quality Surveillance Program,
W72-00424 5G

STIFF, M. J.
The Chemical States of Copper in Polluted Fresh Water and a Scheme of Analysis to Differentiate Them,
W72-00126 5B

STODDART, D. R.
Climatic Geomorphology,
W72-00113 2E

World Erosion and Sedimentation,
W72-00101 2J

SUHR, L. GENE
The Concept of Wastewater Reclamation,

W72-00012 5D

SUMMERS, H. J.
Some Simple Devices for the Study of Wave Induced Surges,
W72-00056 2E

SWASEY, C. C.
Determination of Sodium in Black Liquor Using a Selective Ion Electrode,
W72-00416 5D

TALBOT, A. M.
Some Aspects of Resource Use in Relation to the Orange River Project,
W72-00185 3F

TALCOTT, R. M.
The Use of Ultrafiltration Membranes for Activated Sludge Separation,
W72-00034 5D

TALTS, A.
Phosphate Removal by pH Controlled Lime Dosage,
W72-00415 5D

TANGBORN, W. V.
Inventory of Glaciers in the North Cascades, Washington,
W72-00060 7C

TELETZKE, G. H.
Zimpro Wet Oxidation of Soda Pulping Liquors,
W72-00032 5D

TENNEY, M. W.
Chemical Conditioning of Biological Sludges for Vacuum Filtration,
W72-00037 5D

TENNEY, MARK W.
Disinfection of Algal Laden Waters,
W72-00411 5D

TERJUNG, W. H.
A Global Classification of Solar Radiation,
W72-00169 2D

TEWS, LEONARD L.
Microfungi in the Water, Mud, and Litter of a Cattail Marsh,
W72-00151 5C

THACHER, P. S.
United States Mission To The United Nations,
W72-00237 5G

THALEN, D. C. P.
Range Ecology at the Institute,
W72-00166 3F

TRAVERSY, W. J.
Methods for Chemical Analysis of Waters and Wastewaters,
W72-00086 2K

TRENT, D. S.
Ocean Outfall Design: Part I - Literature Review and Theoretical Development,
W72-00356 5B

TROUGHTON, J. H.
The Relative Role of Stomata in Transpiration and Assimilation,
W72-00175 2D

TROY, JOSEPH C.
The Effects of Various Atmospheres on the Oxidation of Coal Mine Pyrites,
W72-00081 5G

TSAO, G. T.
Gas Absorption in a Heterogeneous System,
W72-00085 5A

TUCKER, R. J.
Streamflow Routing for Water Pollution Studies,
W72-00124 5G

TURNER, D. J.
Dams And Ecology--Can They Be Made Compatible,
W72-00116 8A

TURRILL, C. N.
A New Process For Recovery of By-products From Shellfish Waste,
W72-00025 5D

USTYUZHANIN, B. S.
Effect of Intensive Groundwater use on Streamflow (Ob issledovanii vliyaniya intensivnoy ekspluatatsii podzemnykh vod na stok rek),
W72-00325 2F

VAN EYCK, MARVIN
Direct Digtal Control at Grand Rapids, Michigan,
W72-00043 5D

VARDAPETYAN, S. M.
The Use of Radioactive Carbon Method in Studies of Trophic Relationships of Plankton (Primenenie radiouglerodnogo metoda dlya isucheniya troficheskikh vzaimootnoshenii v planktone),
W72-00161 5C

VEIRS, C. E.
Cattle Feedlots and Alternatives for Waste Management,
W72-00428 5G

VELKOV, D.
Influence of High Temperatures on the Water Regime and Viability of Black Locust-D Robinia-Pseudoacacia-D Seeds,
W72-00540 2I

VERLEGER, P. K.
Defenses and the Role of Industry Lawyers,
W72-00474 6E

VERSHININA, L. K.
Forest Litter as an Accumulator of Moisture (Lesnaya podstilka--akkumulyator vlagi),
W72-00067 2G

VINCENT, G.
Double Dormancy and Germination on the Example of Tilia-D and Carpinus-D Seeds,
W72-00541 2I

VISAGIE, P. J.
Pressures Inside Freezing Water Drops,
W72-00088 2C

VODOGRETSKIY, V. YE.
Estimation of Groundwater Recharge by Atmospheric Precipitation with Few or no Observations of the Groundwater Regime (Metod otsenki pitaniya gruntovykh vod atmosfernymi osadkami pri nedostatochnosti ili otsutstvii nablyudeniy za rezhimom gruntovykh vod),
W72-00324 2F

WADDELL, S. L.
Composition Studies of Activated Sludge,
W72-00443 5D

WAGNER, ROSS I.
Development of a Chemical Denitrification Process,
W72-00001 5D

WARD, C. H.
Kinetic and Stoichiometric Limitations of Phosphate in Pure and Mixed Bacterial Cultures,
W72-00440 5C

WARD, M.
A Method of Tracing Sediment Movement on the Texas Gulf Coast,
W72-00314 2J

WAY, J. M.
Some Ecological Effects on the Use of Paraquat for the Control of Weeds in Small Lakes,
W72-00155 4A

WEBSTER, F.
Optimum Sample Sizes for Concrete Cylinder Tests Using Information Theory,
W72-00076 8F

WEDDLE, CLARK L.
Studies of Municipal Wastewater Renovation For Industrial Water,
W72-00045 5D

WEZERNAK, C. T.
A Field Study of Inorganic Nitrogen Oxidation Rates,
W72-00018 5B

WHEELER, W. H.
Stability of Coastal Plain Surfaces,
W72-00091 2J

WHITE, D. E.
Classification of Public Lands Valuable for Geothermal Steam and Associated Geothermal Resources,
W72-00096 2F

WHITE, GEORGE C.
Problems in Obtaining Adequate Sewage Disinfection,
W72-00419 5D

WHITMARSH, R. B.
Precise Sediment Density Determination by Gamma-Ray Attenuation Alone,
W72-00059 2J

WICKHAM, D. A.
Apparatus for Controlling Ambient Light Cycles in Experimental Environments,
W72-00525 7B

Harvesting Coastal Pelagic Fishes with Artificial Light and Purse Seine,
W72-00533 8I

WIEDEMANN, A. M.
Vegetation Studies in the Simpson Desert, N.T.,
W72-00182 2I

WIGGINS, P. M.
Water Structure as a Determinant of Ion Distribution in Living Tissue,
W72-00207 1B

WILKITIS, J. R.
Management Model for Terrestrial Wildlife Based on Energy Relationships,

W72-00052 6G

WILLIAMS, P. W.
The Geomorphic Effects of Groundwater,
W72-00107 2F

WILLIAMS, R. C.
Streamflow, Sediment-Transport, And Water-Temperature Characteristics Of Three Small Watersheds In The Alsea River Basin, Oregon,
W72-00115 2E

WILSON, HOWARD B.
Wave Action and Breakwater Location, Noyo Harbor, California: Hydraulic Model Investigation,
W72-00370 8B

WILSON, T. V.
Distribution of Moisture in the Unsaturated Profile on a Piedmont Watershed,
W72-00308 2G

Measurement of Interflow and Deep Seepage on Piedmont Watersheds,
W72-00311 2G

WIRSCHING, P. H.
Monte Carlo Study of Seismic Structural Safety,
W72-00072 7C

WITHEROW, J. L.
Phosphate Removal by Activated Sludge,
W72-00008 5D

WIXSON, B.
Missouri Stream Studies Relating to the 'New Lead Belt',
W72-00089 5B

WOLMAN, A.
Man and His Changing Environment,
W72-00405 5G

The Metabolism of Cities,
W72-00403 6B

Technical, Financial, and Administrative Aspects of Water Supply in the Urban Environment in the Americas,
W72-00406 6B

Values in the Control of Environment,
W72-00404 5G

Water-Economics and Politics,
W72-00407 6B

WOOD, D. J.
Analog Analysis of Water Distribution Networks,
W72-00071 7A

WOODSON, R. D.
Cooling Towers,
W72-00337 8D

YAO, J. T. P.
Monte Carlo Study of Seismic Structural Safety,
W72-00072 7C

YARON, D.
A Model for the Economic Evaluation of Water Quality in Irrigation,
W72-00382 3F

YAZAWA, Y.
Horizontal HCl Pickling Line at Fukuyama,
W72-00004 5D

ZATTERA, A.
The Importance of Avoiding Chemical Contamination for a Successful Cultivation of Marine Organisms,
W72-00149 5C

ORGANIZATIONAL INDEX

Hall-Jones Oil Co. v Corporation Commission (Denial of Permit to Dispose of Saline Water).
W72-00006 6E

Design of a Circular Hydraulic Jump,
W72-00074 8B

Patterns of Politics in Water Resources Development,
W72-00075 6E

Geothermal Exploration,
W72-00077 2F

Pollution of Waters of State.
W72-00095 6E

Introduction to Fluvial Processes.
W72-00100 2J

Flood-Plain Management Must Be Ecologically And Economically Sound,
W72-00117 2E

United States V Northwest Paper Co. (Standing to Bring Qui Tam Action under Refuse Act of 1899).
W72-00121 6E

Enquist V Quaker Oats Co. (Standing to Bring Qui Tam Action Under Refuse Act of 1899, and to Seek Injunction).
W72-00140 6E

Zarrow V Hughes (Liability for Oil and Salt Water Overflow from Oil Well).
W72-00146 6E

Effects on Freshwater Microfauna,
W72-00152 5C

Jackson V. Clark (Necessity of Causal Relationship Between Pollution Damage and the Conduct of a Defendant).
W72-00159 6E

Magnolia Pipeline Co V. State (Actions of a Third Party as Defense to Pollution Prosecution).
W72-00160 6E

How Does Forest-Range Conversion in Ozark Uplands Affect Runoff,
W72-00164 4A

Eutrophication,
W72-00165 5C

City of Bethany V. Municipal Securities Co. (Appealing Party Limited to Defenses Raised at Trial).
W72-00167 6E

Resolution Establishing Amended Criteria of Stream Water Quality for Various Uses Adopted by the Board on April 14, 1970.
W72-00188 5G

Permits for New Outlets and Disposal Systems.
W72-00189 5G

Stream Preservation in Arkansas.
W72-00190 2E

Contract Regarding an Interim Supplement to Tanker Liability for Oil Pollution.
W72-00191 5G

Air and Water Pollution Control--Permits.
W72-00202 6E

Florida Litter Law of 1971.
W72-00203 6E

Environmental Protection Act.
W72-00204 6E

Interstate Environmental Compact.
W72-00205 6E

Regulations Concerning Treatment of Wastewaters, Domestic and Industrial, Separately or in Combination, Discharged into the Waters of the Hackensack River.
W72-00206 5D

Regulations Concerning Treatment of Wastewaters, Domestic and Industrial Separately or in Combination, Discharged into the Waters of the Atlantic Coastal Plain, Including the Atlantic Ocean.
W72-00208 5D

Regulations Concerning Treatment of Wastewaters, Domestic and Industrial, Separately or in Combination, Discharged into the Waters of the Wallkill River Basin.
W72-00209 5D

Regulations Concerning Treatment of Wastewaters, Domestic and Industrial, Separately or in Combination, Discharged into the Waters of the Passaic River Including the Newark Bay.
W72-00210 5D

Regulations Concerning Treatment of Wastewaters, Domestic and Industrial, Separately or in Combination, Discharged into the Waters of the Raritan River Basin Including the Raritan Bay.
W72-00211 5D

Regulations Concerning Treatment of Wastewaters, Domestic and Industrial, Separately or in Combination, Discharged into the Waters of the Delaware River Basin.
W72-00212 5D

United Kingdom: Oil in Navigable Waters Act of 1971.
W72-00213 6E

Pickens V. Harrison (Damages to Irrigation Well Caused by Salt Water Pollution from Oil Well).
W72-00214 6E

Waters--Tidal Waters--Power of Legislature to Authorize Pollution of Fisheries.
W72-00215 5G

Oil Spill.
W72-00217 6E

Section 169: Amortization of Pollution Control Facilities.
W72-00218 5G

Rules and Regulations Establishing Surface Water Quality Criteria.
W72-00219 5G

Regulation Establishing Water Quality Criteria For Interstate And Intrastate Streams.
W72-00225 5G

Rural Water And Sanitation Facilities.
W72-00227 6E

Inter-Governmental Maritime Consultative Organization: Draft Convention On Civil Liability For Pollution Damage.
W72-00228 6E

Inter-Governmental Maritime Consultative Organization: Draft Convention On Rights Of Coastal States To Intervene In Casualties On The High Seas Causing Oil Pollution.
W72-00229 6E

International Convention For The Prevention Of Pollution Of The Sea By Oil, 1954 (As Amended).
W72-00230 6E

Agricultural And Related Wastes Control.
W72-00231 5G

Inability Of Traditional Forms Of Political Order To Adapt To Modern Problems Of International Pollution,
W72-00233 5G

International Cooperation To Curb Fluvial And Maritime Pollution,
W72-00236 5G

United States Mission To The United Nations,
W72-00237 5G

Positive Incentives And Negative Controls,
W72-00239 5G

A Bill to Amend the Federal Pollution Control Act, as Amended.
W72-00242 6E

Tax Treatment of Pollution Control Facilities.
W72-00243 5D

An Act to Ban High Phosphate Detergents.
W72-00244 6E

An Act Concerning the Insurance or Bonding of Oil Companies and Carriers.
W72-00245 6E

Clean Water for Mississippi's Estuaries.
W72-00246 5G

Great Lakes Pollution,
W72-00247 5G

Tanker Owners Voluntary Agreement Concerning Liability for Oil Pollution.
W72-00248 6E

Jurisdiction of the Department of Air and Water Pollution Control,
W72-00249 6E

Jurisdiction of the Trustees of the Internal Improvement Trust Fund,
W72-00250 6E

Lawyers as Human Environmentalists Advocate's Environmental Advice,
W72-00252 6E

Suing the Polluter: Approaches to Achieve Standing,
W72-00256 5G

Proposed Regulations of the Department of Interior on Oil Pollution Under the Water Quality Improvement Act of 1970.
W72-00259 5G

Loans to Rural Areas for Water Supply and Sewage Disposal Systems.
W72-00260 5G

Interference With Streams and Waters; Protection of Fish and Game.

W72-00261 6E

Water Pollution Control Act.
W72-00262 6E

Pollution Control Agency.
W72-00263 6E

Licensing and Regulation of use of Oil Spill Cleanup Agents.
W72-00264 6E

Sewage Disposal.
W72-00265 6E

Sales and Use Tax.
W72-00266 6E

Water Pollution Control.
W72-00267 6E

Water Pollution Abatement Grants to Subdivision of the State.
W72-00268 6E

The Challenge of Environmental Quality: An Outline of Remedies to Meet It,
W72-00270 5G

Tax Deductions for Pollution Control Facilities.
W72-00271 6E

Private Action Under the Public Trust: An Environmental Bill of Rights for California,
W72-00272 5G

Pollution Plant Equipment-Tax Benefits.
W72-00273 6E

Protection of Inland Wetlands; Discharge of Waste or Deleterious Substances.
W72-00274 6E

Acquisition of Surface Lands for Water Quality Control.
W72-00275 6E

Mineral Well Act.
W72-00276 6E

Thomas J. Anderson, Gordon Rockwell Environmental Protection Act of 1970.
W72-00277 6E

Public Bathing Beaches.
W72-00278 6E

In the Matter of Mercury Standards.
W72-00279 5G

Rules and Regulations for Mineral Exploration.
W72-00285 6E

Multi-Media Confrontation--The Environmentalist's Strategy for a 'No-Win' Agency Proceeding,
W72-00286 5G

New England Interstate Water Pollution Control Commission.
W72-00287 5G

Parks and Recreation--Sanitation.
W72-00288 5G

Oil Upon the Waters,
W72-00289 5G

Control of Estuarine Pollution,
W72-00290 6E

Sewer Construction.
W72-00291 6E

A Bill to Amend the Fish and Wildlife Coordination Act in Order to Protect Marine Environment by Regulating the Dumping of Wastes in the Coastal and Ocean Waters of the United States.
W72-00292 6E

Permits to Dredge or Fill in or About Estuarine Waters or State Owned Lakes.
W72-00296 6E

Tidal Waters (Excavating and Dredging Regulation).
W72-00297 6E

New Jersey Water Quality Improvement Act of 1971.
W72-00298 6E

Terminals for the Loading or Discharge of Petroleum or Chemical Liquids or Products from Vessels.
W72-00299 5G

Clean Ocean Act.
W72-00302 6E

Navigable Waters: Certain Practices Regulated.
W72-00303 6E

North Carolina Pollution Abatement and Industrial Facilities Financing Act.
W72-00304 6E

Water Dist. No. 105, King County V State (Approval and Certification for Sewer System Construction).
W72-00333 6E

Phillips V. Altman (Covenant Not to Sue as a Defense to a Public Nuisance),
W72-00335 6E

Cooling Towers,
W72-00337 8D

Farmers Chemical Ass'n v. Union Camp Co. (Denial of Jury Trial When Injunction Sought to Abate Pollution).
W72-00343 6E

Scurlock Oil Co. V. Harrell (Action for Damages to Land and Water from Oil Pipeline Leakage).
W72-00353 6E

General Crude Oil Co. V. Aiken (Groundwater Pollution by Saline Water from Oil Drilling Operations as Creating Permanent Damages).
W72-00363 5G

Hazards of Mercury, Special Report to the Secretary's Pesticide Advisory Committee, Department of Health, Education, and Welfare.
W72-00374 5B

Gulf Oil Corp. v. alexander (Pollution of Groundwater by Seepage from Salt Water Disposal Pits).
W72-00381 6E

Ross V. Fink (Statute Prohibiting Salt Water Flow Over Surface of Land Inapplicable to Pollution by Underground Waters).
W72-00387 6E

Prevention of Stream Pollution by Sawdust; Powers of Local Government Concerning Water Supplies.
W72-00389 6E

Environmental Policy and Management,
W72-00390 6B

Applications of Program Budgeting to Environmental Problems,
W72-00391 6B

The Valuation of Public Goods,
W72-00392 6B

Interstate Water Pollution Control.
W72-00397 6E

People V. City of Los Angeles (Municipal Sewage Disposal Regulation by the State Department of Health).
W72-00398 6E

Thompson V. Walsh (Injury to Cattle Resulting From Stream Pollution by Oil Lessee).
W72-00400 6E

Sunray Oil Co. V. Burge (Action Against Petroleum Product Manufacturer for Damage to Livestock from Drinking Poisonous Water.
W72-00401 6E

The Metabolism of Cities,
W72-00403 6B

Values in the Control of Environment,
W72-00404 5G

Man and His Changing Environment,
W72-00405 5G

Technical, Financial, and Administrative Aspects of Water Supply in the Urban Environment in the Americas,
W72-00406 6B

Water-Economics and Politics,
W72-00407 6B

Mid-Continent Pipeline Co v Crauthers (Release of Servant Tortfeasor).
W72-00413 6E

Nomograph Solution of Heat Requirements for Digesters.
W72-00417 5D

Globe Aircraft Co. v. Thompson (Damages for Acid Poisoning of Cattle).
W72-00418 6E

Technology and Management of the Environment.
W72-00426 5G

Boating Litter and Pollution Control.
W72-00438 6E

River Pollution in International Law,
W72-00450 5G

Landowner's Right to Relief Against Pollution of His Water Supply by Industrial or Commercial Waste,
W72-00452 6E

Cases and Materials on Environmental Law,
W72-00456 6E

Water Pollution Control Programs.
W72-00457 5G

Peterson V. Texas Co. (Liability for Damages Caused by Escape Wastes from Oil Lease),

W72-00458 6E

Controlling Pollution: The Economics of a Cleaner America,
W72-00459 5G

Town of Braggs V. Slape (Liability for Damages Caused by Municipal Discharge of Raw Sewage).
W72-00460 6E

City of Bethany v. Twin Lakes Gun Club (Measuring Damages to Plaintiff's Lake from Pollution from City Sewage Disposal Plant).
W72-00461 6E

What is Pollution,
W72-00462 5G

Pure Oil v. Renton (Action for Damages to Realty from Pollution of Stream by Saline Water).
W72-00463 6E

Effluents and Affluence,
W72-00464 5G

Wood Oil Co. v. Vendicott (Damage to Realty and Personalty from Oil Wells).
W72-00465 6E

North v. Evans (Damage to Land from Salt Water Discharged from Oil Wells).
W72-00466 6E

The Annual Report of the Council of Economic Advisors, 1966.
W72-00467 5G

The 1971 Water Pollution Study for the State of Tennessee,
W72-00475 6E

Tennessee Water Quality Control Act of 1971 with Commentary,
W72-00476 6E

Alabama (Analysis and Comparison with Tennessee Water Pollution Control Law),
W72-00477 6E

Alaska (Analysis and Comparison with Tennessee Water Law),
W72-00478 6E

Arizona (Analysis and Comparison with Tennessee Water Pollution Control Law),
W72-00479 6E

Arkansas (Analysis and Comparison with Tennessee Water Pollution Law),
W72-00480 6E

California (Analysis and Comparison with Tennessee Water Pollution Law),
W72-00481 6E

Colorado (Analysis and Comparison with Tennessee Water Pollution Law),
W72-00482 6E

Florida (Analysis and Comparison with Present and Proposed Tennessee Water Pollution Law),
W72-00483 6E

Hawaii (Analysis and Comparison with Present and Proposed Tennessee Water Pollution Law),
W72-00484 6E

Indiana (Analysis and Comparison with Tennessee Water Pollution Law),
W72-00485 6E

Iowa (Analysis and Comparison with Present and Proposed Tennessee Water Pollution Law),
W72-00486 6E

Kansas (Analysis and Comparison of Kansas and Tennessee Water Pollution Law),
W72-00487 6E

Kentucky (Analysis and Comparison with Present and Proposed Tennessee Water Pollution Law),
W72-00488 6E

Louisiana (Analysis of State's Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00489 6E

Maine (Analysis of State's Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00490 6E

Maryland (Analysis of Maryland Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00491 6E

Massachusetts (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00492 6E

Michigan (Analysis of Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00493 6E

Minnesota (Analysis of State's Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00494 6E

Mississippi (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00495 6E

Montana (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00496 6E

Nebraska (Analysis of State's Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00497 6E

Nevada (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00498 6E

New Hampshire (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00499 6E

New Jersey (Analysis of State's Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00500 6E

New Mexico (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00501 6E

New York (Analysis of State's Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00502 6E

North Dakota (Analysis of State's Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00503 6E

Ohio (Analysis of State's Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00504 6E

Oklahoma (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00505 6E

Oregon (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00506 6E

Pennsylvania (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00507 6E

Rhode Island (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00508 6E

South Carolina (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00509 6E

South Dakota (Analysis of State's Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00510 6E

Utah (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00511 6E

Vermont (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00512 6E

Virginia (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00513 6E

Washington (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00514 6E

West Virginia (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00515 6E

Wisconsin (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00516 6E

Wyoming (Analysis of State Water Pollution Law and Comparison with Present and Proposed Tennessee Law),
W72-00517 6E

Federal Water Pollution Control Act,

W72-00518 6E

Supplement to Federal Program Sections,
W72-00519 6E

Annual User Surveillance Fee,
W72-00520 6E

Seasonal Variations in the Food of Juvenile Herring in Coastal Waters of Maine.
W72-00523 2I

Food of 3 Species of Sunfishes Lepomis Centrarchidae and Their Hybrids in 3 Minnesota Lakes,
W72-00524 2H

Apparatus for Controlling Ambient Light Cycles in Experimental Environments,
W72-00525 7B

Occurrence of Juvenile Snook Centropomus-Undecimalis in North-Carolina Waters,
W72-00526 2I

Constant Flow Delivery Device for Chronic Bioassay,
W72-00527 5A

A Quantitative Artificial Substrate Sampler for Benthic Macro Invertebrates,
W72-00528 5C

Separation of Taxonomically Identifiable Organisms and Detritus Taken from Shad Foregut Contents Using Density Gradient Centrifugation, 1970, Prosobranchia Muricidae,
W72-00529 2I

Dissolved Oxygen Requirements of Freshwater Fishes,
W72-00530 5C

A List of Scientific and Semi-Popular Periodicals on Inland Fisheries and Aquaculture.
W72-00531

A 1 Year Study of Primary Production in Lake Skadar,
W72-00532 2H

Harvesting Coastal Pelagic Fishes with Artificial Light and Purse Seine,
W72-00533 8I

Impacts of Nuclear Power Plants on the Environment,
W72-00534 5C

Environmental Health and Ecology: Old Concepts with New Meaning for Mans Survival,
W72-00535 5G

Dehydration and Water Intoxication of Range Cattle,
W72-00536 5C

Beef Production on Irrigated Alfalfa-D Pastures,
W72-00537 3F

Safe Use of Pesticides on Livestock,
W72-00538 5G

Veterinary Medicine in the Conservation and Management of Marine Mammal Resources,
W72-00539 2I

Influence of High Temperatures on the Water Regime and Viability of Black Locust-D Robinia-Pseudoacacia-D Seeds,
W72-00540 2I

Double Dormancy and Germination on the Example of Tilia-D and Carpinus-D Seeds,
W72-00541 2I

Flood Damage to Crops in Depression Areas of Northcentral Iowa,
W72-00542 3F

Magnolia Petroleum Co. V. McGeeley (Payment for Void Easements as Offset to Recovery for Pollution Damages).
W72-00543 6E

Kinnischtzke V. City of Glen Ullin (Liability of Municipality Discharging Inadequately Treated Sewage).
W72-00544 6E

Unlined Mole Lines for Irrigation,
W72-00545 3F

Stress Strain Characteristics of a Saturated Clay Soil at Various Rates of Strain,
W72-00546 2G

Discussion of Stress Characteristics of a Saturated Clay Soil at Various Rates of Strain,
W72-00547 2G

Epoxidation of Aldrin by a Freshwater Ostracod,
W72-00548 5C

Forecasting Downy Mildews and Late Blight in Israel,
W72-00549 3F

Overhead Irrigation of Apple-D Orchards as a Factor in Epidemic Development of Bitter Rot Gloeosporium-Fructigenum,
W72-00550 3F

Effect of Air Humidity on the Development of Powdery Mildew on Cucurbits-D,
W72-00551 3F

Trends in Epidemiological Research,
W72-00552 3F

An Agro Meteorological Method of Forecasting the Appearance of Grapevine-D Downy Mildew Plasmopara-Viticola in Israel,
W72-00553 3F

70 Years with Wheat-M in Kenya,
W72-00554 3F

Effect of Soil Moisture and Aeration on Fungal Activity, an Introduction,
W72-00555 5C

Effect of Soil Water on Microbial Growth Antagonism and Nutrient Availability in Relation to Soil-Borne Fungal Diseases of Plants,
W72-00556 5C

Comparative Fatty-Acid Changes During the Rapid Growth of Trout in Salt Water Ponds,
W72-00557 2I

Responses of Inter Tidal Invertebrates to Low Oxygen Conditions,
W72-00558 5C

Water and Electrolyte Budgets in a Field Population of the Desert Lizard Sauromalus-Obesus,
W72-00559 2I

Water Turnover in the Mohave Sand Lizard Umascoparia,
W72-00560 2I

Salt and Water Balance in Stonefly Naiads Pteronarcys-Californica Plecoptera,
W72-00561 2I

Free Amino-Acid and Electrolyte Adjustments in the Sipunculid Worm Themiste-Dyscritum During Salinity Stress,
W72-00562 2I

Effect of Environmental Salinity on the Incorporation of Tritiated Leucine in Gills of a Fresh Water Teleost Xiphophorus-Maculatus,
W72-00563 5C

Water Pumping Activity in Field Populations of Marine Demospongiae,
W72-00564 2I

The Distribution and Abundance of the Inter Tidal Prosobranchs Littorina-Scutulata and Littorina-Sitkana,
W72-00565 2I

DDT Inhibition of Intestinal Salt and Water Absorption in Teleosts,
W72-00566 5C

Interference with a Memory Process by DDT in Goldfish,
W72-00567 5C

Preliminary Biological Reconnaissance of Aquatic Habitats, Cumberland Peninsula, Baffin Island,
W72-00568 2I

Uptake of Sulfur-35 Amino-Acids by Symbiotic Algae Zoochlorellae from the Food of Green Hydra,
W72-00569 5C

Further Studies on the Vertical Distribution of Fresh Water Planarians in the Japanese Islands,
W72-00570 2I

ACADEMIA R.P.R., BUCHAREST (RUMANIA). INSTITUTUL DE BIOLOGIE.
Comparative Study of the Oxygen Consumption in Ctenopharyngodon Idella and Hypophthalmichthys Molitrix Embryos and Larvae - First Stages, (Cercetari Asupra Metabolimului Energetic la Speciile Ctenopharyngodon Idella si Hypophthalmichthys Molitrix in Stadiile Embrionare si in Primele Stadii Larvare),
W72-00145 5C

ACADEMIA R.S.R., BUCHAREST (RUMANIA). INSTITUTUL DE BIOLOGIE.
The Influence of Oxygen Concentration on Routine Metabolism of Cyprinus Carpio L. in Different Temperature Conditions, (Influenta Concentratiei de Oxigen Asupra Metabolismului Energetic la Cyprinus Carpio L. in Diferite Conditii de Temperatura),
W72-00144 5C

ADVISORY COMMISSION ON WATER POLLUTION CONTROL, HELSINKI (FINLAND).
Water Pollution In International Law,

W72-00223 5G

AKADEMIYA NAUK SSSR, LENINGRAD. ZOOLOGICHESKII INSTITUT.
The Use of Radioactive Carbon Method in Studies of Trophic Relationships of Plankton (Primenenie radiouglerodnogo metoda dlya isucheniya troficheskikh vzaimootnoshenii v planktone),
W72-00161 5C

ALABAMA GEOLOGICAL SURVEY, UNIVERSITY.
Gibbsite in Coastal Plain Soils, Southeastern United States,
W72-00090 2G

ALASKA STATE DEPT. OF HEALTH AND WELFARE, COLLEGE.
Treatment by Freezing,
W72-00436 5D

ALASKA UNIV., COLLEGE. INST. OF MARINE SCIENCE.
Dynamics of the Nitrogen Cycle in Lakes,
W72-00354 5C

ALL-UNION DESIGNING, SURVEYING AND SCIENTIFIC RESEARCH INST. HYDROPROJECT, MOSCOW (USSR).
Study of Natural Stress Distribution in Rock Massifs with the Help of Seismic-acoustic methods,
W72-00079 8E

AMERICAN PUBLIC WORKS, ASSOCIATED, CHICAGO, ILL.
Feasibility of Computer Control of Wastewater Treatment.
W72-00408 5D

AMERICAN SOCIETY OF INTERNATIONAL LAW, WASHINGTON, D.C.
Goals And Strategies For Combating International Pollution,
W72-00235 5G

AMOCO CHEMICALS CORP., WHITING, IND.
Hydraulic and Process Aspects of Reactor Design, II-Response to Variations,
W72-00439 5D

ANNE ARUNDEL COUNTY DEPT. OF PUBLIC WORKS, GLEN BURNIE, MD.
Phosphate Removal by pH Controlled Lime Dosage,
W72-00415 5D

ARIZONA UNIV., TUCSON; AND NEW MEXICO UNIV., ALBUQUERQUE.
Monte Carlo Study of Seismic Structural Safety,
W72-00072 7C

ARIZONA UNIV., TUCSON. DEPT. OF GEOGRAPHY; AND UNIVERSITY COLL., LONDON (ENGLAND).
Public Perception of Environmental Quality in Tucson, Arizona,
W72-00174 5G

ARIZONA UNIV., TUCSON. INST. OF ATMOSPHERIC PHYSICS.
Summer Rainfall over the Santa Catalina Mountains,
W72-00168 2B

ARKANSAS POLLUTION CONTROL COMMISSION, LITTLE ROCK.
Annual Progress Report 1969-1970.
W72-00451 5G

ARMY COASTAL ENGINEERING RESEARCH CENTER.
Comparison of Pressure and Staff Wave Gage Records,
W72-00352 7B

ARMY COASTAL ENGINEERING RESEARCH CENTER, WASHINGTON, D.C.
Analysis of Wave Records,
W72-00350 7B

Waves Generated by Piston-Type Wavemaker,
W72-00351 8B

ARMY ENGINEER DISTRICT, TULSA, OKLA.
Oklahoma Copan Lake. Little Caney River, Flood Control, Water Qaulity, Water Supply, Fish and Wildlife and Recreation Lake Located in Washington, County.
W72-00348 6G

ARMY ENGINEER WATERWAYS EXPERIMENT STATION, VICKSBURG, MISS.
Effect of Valve Position in a Sidewall Port Filling System, Newburgh Lock, Ohio River: Hydraulic Model Investigation,
W72-00346 8B

Webers Falls Lock and Dam, Arkansas River Navigation Project: Hydraulic Model Investigation,
W72-00347 8B

Expansion of Santa Barbara Harbor, California. Hydraulic Model Investigation,
W72-00349 6B

Jones Bluff Lock and Dam, Alabama River Navigation Project: Hydraulic Model Investigation,
W72-00359 8B

Navigation Conditions in Fort Smith Reach, Arkansas River. Hydraulic Model Investigation,
W72-00360 8B

Mechanics of Flow from Stratified Reservoirs in the Interest of Water Quality: Hydraulic Laboratory Investigation,
W72-00361 5F

Expansion and Revision of Kawaihae Harbor, Hawaii: Hydraulic Model Investigation,
W72-00364 8B

Navigation Conditions at Lock and Dam No. 7, Arkansas River: Hydraulic Model Investigation,
W72-00365 8B

Design for Expansion of Port San Luis, California; Hydraulic Model Investigation,
W72-00366 8B

Wave Action in Mission Bay Harbor, California: Hydraulic Model Investigation,
W72-00367 8B

Ansonia-Derby Local Protection Project, Naugatuck and Housatonic Rivers, Connecticut: Hydraulic Model Investigation,
W72-00368 8B

Outlet Works for Beltzville Dam, Pohopoco Creek, Pennsylvania: Hydraulic Model Investigation,
W72-00369 8B

Wave Action and Breakwater Location, Noyo Harbor, California: Hydraulic Model Investigation,
W72-00370 8B

Outlet Works for New Hope Reservoir Cape Fear River Basin, North Carolina: Hydraulic Model Investigation,
W72-00371 8B

Spillway for Kaysinger Bluff Dam Osage River, Missouri, Hydraulic Model Investigation,
W72-00372 8B

Navigation Conditions at Hannibal Locks and Dam, Ohio and West Virginia: Hydraulic Model Investigation,
W72-00373 8B

ARMY ENGINEER WATERWAYS EXPERMENT STATION, VICKSBURG, MISS.
Navigation Conditions at Lock and Dam No. 3, Arkansas River, Arkansas and Oklahoma, Hydraulic Model Investigation,
W72-00362 8B

ARMY TERRESTRIAL SCIENCES CENTER, HANOVER, N.H.
On the Rates of Growth of Grains and Crystals in South Polar Firn,
W72-00329 2C

ATOMIC ENERGY COMMISSION, WASHINGTON, D.C.
Licensing of Production and Utilization Facilities--Implementation of National Environmental Policy Act of 1969.
W72-00300 5G

AUBURN UNIV., ALA.
Movement-Behavior in Three Species of Colonial-Nesting Wading Birds: A Radio-Telemetric Study,
W72-00051 7B

Effects of Radiation on Textile Wastes and Starch Solutions,
W72-00410 5D

AUBURN UNIV., ALA. DEPT. OF AGRICULTURAL ENGINEERING.
Ditch Drainage of Anisotropic Nonhomogeneous Porous Media: A Model Study,
W72-00309 2G

AUBURN UNIV., ALA. DEPT. OF CIVIL ENGINEERING.
A Study Of Color Removal From Textile Dye Wastes By Chemical Coagulation,
W72-00049 5D

Coagulation Of Textile Dye Wastes,
W72-00050 5D

AUCKLAND UNIV. (NEW ZEALAND). DEPT. OF MEDICINE.
Water Structure as a Determinant of Ion Distribution in Living Tissue,
W72-00207 1B

AUSTRALIAN NATIONAL UNIV., CANBERRA. RESEARCH SCHOOL OF BIOLOGICAL SCIENCES; AND AUSTRALIAN NATIONAL UNIV., CANBERRA. DEPT. OF ENVIRONMENTAL BIOLOGY.
The Relative Role of Stomata in Transpiration and Assimilation,

AUSTRALIAN NATIONAL UNIV., CANBERRA. RESEARCH SCHOOL OF

W72-00175 2D

BECHTEL CORP., SAN FRANCISCO, CALIF. ENVIRONMENTAL SYSTEMS GROUP.
Studies of Municipal Wastewater Renovation For Industrial Water,
W72-00045 5D

BEDFORD INST., DARTMOUTH (NOVA SCOTIA). ATLANTIC OCEANOGRAPHIC LAB.
Sand Waves on Browns Bank Observed from the Shelf Diver,
W72-00130 2J

BEDFORD INST., DARTMOUTH (NOVA SCOTIA). ATLANTIC OCEANOGRAPHIC LAB.
Sedimentological Sampling and Results from the Diver Lock-out Facility of the Submersible Shelf Diver, Bay of Fundy, Nova Scotia,
W72-00131 2L

BERNARD COLL., NEW YORK.
Ecological Determinants In Pollution Control Systems,
W72-00232 5G

BIRMINGHAM UNIV. (ENGLAND). DEPT. OF PHYSICS.
The Mechanical Properties of Single Crystals of Pure Ice,
W72-00336 2C

BRISTOL UNIV. (ENGLAND). DEPT. OF GEOGRAPHY.
Infiltration, Throughflow, And Overland Flow,
W72-00105 2G

Erosion by Water on Hillslopes,
W72-00106 2J

BRISTOL UNIV. (ENGLAND). DEPT. OF GEOLOGY.
The Bristol Fall Column for Coarse Sediment Grading,
W72-00057 2J

BRITISH COLUMBIA UNIV., VANCOUVER. SCHOOL OF LAW.
International Law and Pollution of International Rivers and Lakes,
W72-00280 5G

Oil Pollution Problems on the Pacific Coast,
W72-00281 5G

BRITISH METEOROLOGICAL OFFICE, BRACKNELL (ENGLAND).
Possible Effects of Human Activity on World Climate,
W72-00171 5C

BUREAU OF RECLAMATION, DENVER, COLO. ENGINEERING AND RESEARCH CENTER.
Turkey Creek Channel Stability Studies, Farwell Unit, Middle Loup Division, Picksloan Missouri Basin Program.
W72-00376 8D

BUREAU OF RECLAMATION, EPHRATA, WASH.
Design Considerations for Agricultural Drains on the Columbia Basin Project,
W72-00341 8B

CALGON CORP., PITTSBURGH, PA.
New Applications of On-stream Analysers in Pulp Mills,
W72-00009 5A

Coagulants for Waste Water Treatment,
W72-00014 5D

CALIFORNIA STATE DEPT. OF PUBLIC HEALTH, BERKELEY.
Problems in Obtaining Adequate Sewage Disinfection,
W72-00419 5D

CALIFORNIA STATE DEPT. OF WATER RESOURCES, LOS ANGELES.
Satisfying Water Needs in Southern California,
W72-00340 6D

CALIFORNIA UNIV., BERKELEY.
Transcripts of the Speeches, National Conference on Environmental Law.
W72-00468 6E

The Legal Future: New Theories of Environmental Protection,
W72-00469 6E

Economic and Technical Problems in Environmental Litigation.
W72-00470 6E

The Functions and Features of Private Litigation in the Growth of Environmental Law,
W72-00471 6E

The Legal Profession's Leadership in Rebuilding Environmental Quality,
W72-00472 6E

Environmental Lawyer in the Lion's Mouth: Litigation Before and Against Administrative Agencies,
W72-00473 6E

Defenses and the Role of Industry Lawyers,
W72-00474 6E

CALIFORNIA UNIV., DAVIS. DEPT. OF GEOGRAPHY.
The Quaternary Deltaic and Channel System in the Central Great Valley, California,
W72-00177 2J

CALIFORNIA UNIV., LOS ANGELES. DEPT. OF BOTANICAL SCIENCES.
Model for Iso-Osmotic Water Flow in Plant Roots,
W72-00178 2I

CALIFORNIA UNIV., LOS ANGELES. DEPT. OF GEOGRAPHY.
A Global Classification of Solar Radiation,
W72-00169 2D

CALIFORNIA UNIV., RIVERSIDE.
Evaluation Strategies and Water Resource Development,
W72-00429 6B

CALIFORNIA UNIV., RIVERSIDE. DEPT. LIFE SCIENCES.
Some Aspects of Water Balance in Tenebrionid Beetles and a Thysanuran From the Namib Desert of Southern Africa,
W72-00184 2I

CALIFORNIA WATER RESOURCES CONTROL BOARD, SACRAMENTO.
San Francisco Bay-Delta Water Quality Control Program: Final Report.
W72-00454 5G

CAMBRIDGE UNIV. (ENGLAND). DEPT. OF GEOGRAPHY.
World Erosion and Sedimentation,
W72-00101 2J

The Drainage Basin As The Fundamental Geomorphic Unit,
W72-00102 2J

The Role Of Water In Rock Disintegration,
W72-00103 2J

Periglacial Morphometry,
W72-00111 2C

Climatic Geomorphology,
W72-00113 2E

CANADIAN GENERAL ELECTRIC CO. LTD., TORONTO (ONTARIO).
Development of an HVDC Solid State Back to Back Asynchronous Tie,
W72-00338 8C

CAPE TOWN UNIV. (SOUTH AFRICA). DEPT. OF BOTANY.
Some Aspects of Resource Use in Relation to the Orange River Project,
W72-00185 3F

CATHOLIC UNIV., OF AMERICA, WASHINGTON, D.C.
Light Scattering and Ultrasonic Investigations of Relaxation in Aqueous Solutions,
W72-00378 1A

CENTER FOR THE ENVIRONMENT AND MAN.
A Return to the Coast,
W72-00393 2L

CENTER FOR THE ENVIRONMENT AND MAN INC., HARTFORD, CONN.
Global Environmental Monitoring,
W72-00162 5C

CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE, GRENOBLE (FRANCE). LABORATOIRE DE GLACIOLOGIE.
The Dynamics of Temperature Glaciers from the Detailed Viewpoint,
W72-00087 2C

CHRYSLER CORP., DETROIT, MICH.
Wastewater Treatment At The Chrysler Corp. Toledo Machining Plant,
W72-00023 5D

CINCINNATI UNIV., OHIO.
Reaeration through Low Dams in the Ohio River,
W72-00032 5G

Clarification of the Lime Bearing Wastes from a Sole Leather Tannery,
W72-00434 5D

CIVIL ENGINEERING MAGAZINE, NEW YORK.
Dams And Ecology--Can They Be Made Compatible,
W72-00116 8A

CLEMSON UNIV., S.C.
Measurement of Interflow and Deep Seepage on Piedmont Watersheds,
W72-00311 2G

CLEMSON UNIV., S.C. DEPT. OF AGRICULTURAL ENGINEERING.
Distribution of Moisture in the Unsaturated Profile on a Piedmont Watershed,

W72-00308 2G

CLEMSON UNIV., S.C. DEPT. OF ELECTRICAL ENGINEERING.
Water Resource Pollutant Identification by Digital Computer Analysis of Remote Infrared Sensor Spectral Intensities,
W72-00305 5A

COLD REGIONS RESEARCH AND ENGINEERING LAB., HANOVER, N.H.
Spring Breakup of the Delta River, Alaska,
W72-00094 2C

The Growth of Bonds and the Increase of Mechanical Strength in a Dry Seasonal Snow-Pack,
W72-00334 2C

COLORADO STATE UNIV., FORT COLLINS. DEPT. OF CIVIL ENGINEERING.
Open Channel Flow,
W72-00108 8B

COLORADO STATE UNIV., FORT COLLINS. DEPT. OF GEOLOGY.
Geomorphic Implications of Climatic Changes,
W72-00114 2E

Experimental Study Of Channel Patterns,
W72-00119 2E

COLORADO UNIV., DENVER.
Interbasin Transfers: Do We Need Them,
W72-00402 6D

COLUMBIA UNIV., N.Y. SCHOOL OF LAW.
Principles of Responsibility in International Law,
W72-00251 6E

COLUMBIA UNIV., NEW YORK.
International Developments In Water Pollution Control: Principles Of Responsibility: Continental Europe,
W72-00234 5G

COMITATO NAZIONALE PER L'ENERGIA NUCLEARE, LA SPEZIA (ITALY). LABORATORIO PER LO STUDIO DELLA CONTAMINAZIONE RADIOATTIVA DEL MARE.
The Importance of Avoiding Chemical Contamination for a Successful Cultivation of Marine Organisms,
W72-00149 5C

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION, CAMBERRA (AUSTRALIA). RANGELANDS RESEARCH UNIT.
Vegetation Studies in the Simpson Desert, N.T.,
W72-00182 2I

CONSOLIDATED EDISON CO. OF NEW YORK, INC., N.Y.
Power for Tomorrow: The Siting Dilemma,
W72-00269 5G

COOKE, MOULTON, BELLINGHAM AND LONGO, BILLINGS, MONT.
Possible Liabilities Arising from Violations of Conservation Orders,
W72-00220 6E

COPELAND PROCESS CORP., OAK BROOK, ILL.
The Copeland Process Fluid Bed System and Pollution Control World Wide,
W72-00447 5D

CORNELL, HOWLAND, HAYES, AND MERRYFIELD/HILL, CORVALLIS, OREG.
The Concept of Wastewater Reclamation,
W72-00012 5D

CORNELL, HOWLAND, HAYES, MERRYFIELD/HILL, CORVALLIS, OREG.
Industrial Effluents of the Northwest,
W72-00427 5G

CORNELL UNIV., ITHACA, N.Y. DEPT. OF CITY AND REGIONAL PLANNING.
Multistage Marginal Cost Model of Investment-Pricing Decisions: Application to Urban Water Supply Treatment Facilities,
W72-00386 6C

CORPS OF ENGINEERS, OMAHA, NEBR.
Food Plain Information, Bad River at Fort Pierre, South Dakota.
W72-00055 4A

Clarification Of Turbid Water By Filter Fabrics,
W72-00120 5G

COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH, PRETORIA (SOUTH AFRICA). NATIONAL PHYSICAL RESEARCH LAB.
Pressures Inside Freezing Water Drops,
W72-00088 2C

COUNCIL ON ENVIRONMENTAL QUALITY, WASHINGTON, D.C.
National Oil and Hazardous Substances Pollution Contingency Plan.
W72-00301 6E

DELAVAL SEPARATOR CO., POUGHKEEPSIE, N.Y.
Process Control of Centrifuge Operations,
W72-00017 5D

DELAWARE RIVER BASIN COMMISSION, TRENTON, N.J.
Positive Incentives And Negative Controls,
W72-00240 5G

DEPARTMENT OF AGRICULTURE, MITCHELL, NEBR., AND DEPARTMENT OF AGRICULTURE, FORT COLLINS, COLO.
Pressure Distribution on a Center-pivot Sprinkler Irrigation System,
W72-00078 8B

DEPARTMENT OF DEFENSE, WASHINGTON, D.C.
Environmental Considerations in Department of Defense Actions.
W72-00295 6E

DEPARTMENT OF FISHERIES AND FORESTRY, OTTAWA (ONTARIO). INLAND WATERS BRANCH.
Methods for Chemical Analysis of Waters and Wastewaters,
W72-00086 2K

DEPARTMENT OF FISHERIES AND FORESTRY, SAINTE FOY (QUEBEC).
Exotic Pebbles in Quaternary Deposits from the South Coast of the St. Lawrence Estuary, Quebec,
W72-00134 2L

DEPARTMENT OF THE ARMY, WASHINGTON, D.C.
The Evolution of a Funding Policy,
W72-00395 6B

DOMINION BRIDGE CO. LTD., WINNIPEG (MANITOBA).
Nelson River HVDC Transmission Line Towers,
W72-00339 8C

DORR OLIVER, INC., STAMFORD, CONN.
The Use of Ultrafiltration Membranes for Activated Sludge Separation,
W72-00034 5D

DUKE UNIV., DURHAM. MARINE LAB.
Organic Carbon in Sediments of the North Carolina Continental Rise,
W72-00092 2J

DURHAM UNIV. (ENGLAND). DEPT. OF GEOGRAPHY.
The Geomorphology And Morphometry Of Glacial And Nival Areas,
W72-00110 2C

EIDGENOESSICHE ANSTALT FUR WASSERVERSORGUNG, ABWASSERREINIGUNG AND GEWAESSERCHURTZ, ZURICH (SWITZERLAND).
Nitrogen Cycle and Primary Production in Mesotrophic Lake Lucerne (Horwer Bay) and in Eutrophic Red Lake with Special Regard to Nitrates as Limiting Factors (Stickstoff-Kreislauf und Primaproduktion im Mesotrophen Vier-Waldstattrsee (Horwer Bucht) und im Eutrophen Rotsee, mit Besonderer Berucksichtigung des Nitrats als Limitierenden Faktors),
W72-00158 5C

EMSCHERGENOSSENSCHAFT ESSEN (WEST GERMANY): AND LIPPEVERBAND, ESSEN (WEST GERMANY).
Purification of Wastes From a German Yeast Plant,
W72-00446 5D

ENERGY SYSTEMS, INC., MELBOURNE, FLA.
Biological--Gamma-Radiation System for Sewage Processing,
W72-00383 5D

ENGINEERING-SCIENCE, INC., OAKLAND, CALIF.
Chlorinated Hydrocarbons: Emerging Implications in Regional Planning,
W72-00038 5B

ENVIRONMENTAL POLLUTION CONTROL, INC., OCONOMOWOC, WIS.
Systemation in Using the Rotating Biological Surface (RBS) Waste Treatment Process,
W72-00435 5D

ENVIRONMENTAL PROTECTION AGENCY, PORTLAND, OREG. WATER QUALITY OFFICE.
Cattle Feedlots and Alternatives for Waste Management,
W72-00428 5G

ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C.
State Certification of Activities Requiring Federal License or Permit.
W72-00293 6I

ENVIRONMENTAL SCIENCE SERVICES, CORP., STAMFORD, CONN.
Manpower Requirements and Needs for Waste Water Treatment Facility Operation,

W72-00033 5D

FEDERAL POWER COMMISSION, WASHINGTON, D.C.
Water Quality Standard Certifications.
W72-00294 6E

FEDERAL WATER POLLUTION CONTROL ADMINISTRATION, ATHENS, GA. SOUTHEAST WATER LAB.
Discussion of 'BOD From Poultry Processing Plants',
W72-00445 5D

FEDERAL WATER POLLUTION CONTROL ADMINISTRATION, DULUTH, MINN. NATIONAL WATER QUALITY LAB.
Effects of Copper on Gammarus Pseudolimnaeus, Physa Integra, and Campeloma Decisum in Soft Water,
W72-00148 5C

FISH CULTURE RESEARCH TRAINING INST., MALACCA (MALAYSIA).
Experimental Criteria for Studying Grass Carp Feeding in Relation to Weed Control,
W72-00163 4A

FLORIDA DEPT. OF AIR AND WATER POLLUTION CONTROL, TALLAHASSEE.
Pollution of Waters.
W72-00216 6E

FLORIDA UNIV., GAINSVILLE.
Sludge Activity Parameters and Their Application to Toxicity Measurements and Activated Sludge,
W72-00020 5D

FOOD, CHEMICAL, AND RESEARCH LABS., INC., SEATTLE, WASH.
A New Process For Recovery of By-products From Shellfish Waste,
W72-00025 5D

FOREST SERVICE (USDA), PARSONS, W.VA.
Nature and Extent of Macropores in Forest Soils and Their Influence on Subsurface water Movement,
W72-00313 2G

FRAM CORP., EAST PROVIDENCE, R.I.
Bio-regenerated Activated Carbon Treatment of Textile Dye Wastewaters,
W72-00003 5D

FRANKFURT UNIV. (WEST GERMANY).
Liability In National And International Law For Damage Through Water Pollution,
W72-00224 5G

GARRETT AIRESEARCH MANUFACTURING CO., LOS ANGELES, CALIF.
Preliminary Design And Development Of The Intermediate Water Recovery System, (Volume I).
W72-00046 5D

GARRETT RESEARCH AND DEVELOPMENT CO., LA VERNE, CALIF.
Study of Unconventional Methods for Brine Concentration,
W72-00379 3A

GEOLOGICAL SURVEY, AUSTIN, TEX. WATER RESOURCES DIV.
Annual Compilation and Analysis of Hydrologic Data for Elm Fork Trinity River, Trinity River Basin, Texas, 1969,
W72-00097 7C

GEOLOGICAL SURVEY, HARRISBURG, PA.
Acidity Control in Bald Eagle Creek and West Branch Susquehanna River, Clinton County, Pennsylvania.
W72-00128 5B

GEOLOGICAL SURVEY, HARRISBURG, PA., WATER RESOURCES DIV.
Chemical and Biological Conditions in Bald Eagle Creek and Prognosis of Trophic Characteristics of Foster Joseph Sayers Reservoir, Centre County, Pennsylvania,
W72-00129 5C

GEOLOGICAL SURVEY, WASHINGTON, D. C.
Inventory of Glaciers in the North Cascades, Washington,
W72-00060 7C

Classification of Public Lands Valuable for Geothermal Steam and Associated Geothermal Resources,
W72-00096 2F

Index of Surface-Water Records to September 30, 1970--Part 10. The Great Basin.
W72-00098 7C

Index of Surface-Water Records to September 30, 1970--Part 15. Alaska.
W72-00099 7C

Streamflow, Sediment-Transport, And Water-Temperature Characteristics Of Three Small Watersheds In The Alsea River Basin, Oregon,
W72-00115 2E

GEORGE WASHINGTON UNIV., WASHINGTON, D. C. NATIONAL LAW CENTER.
Radioactive Waste and the Environment,
W72-00193 5B

GOSUDARSTVENNYI GIDROLOGICHESKII INSTITUT, LENINGRAD (USSR).
Experimental Hydrologic Investigations at Valday (Eksperimental'nyye gidrologicheskiye issledovaniya na Valdaye).
W72-00061 2B

Procedures for Computing Evaporation from 20-Square-Meter Evaporation Pans Based on Observations in GGI-3,000 Evaporimeters (Metodika rascheta ispareniya s basseynov ploshchad'yu 20 m2 po nablyudeniyam v isparitelyakh GGI-3,000),
W72-00062 2D

Characteristics of Evaporation from Industrial Wastes (Osobennosti ispareniya s promyshlennykh stokov),
W72-00063 5B

Effect of Precipitation and Evaporation on Changes in Solution Concentration (Vliyaniye dozhdey i ispareniya na izmeneniye kontsentratsii rastvorov),
W72-00064 5B

Estimation of Intercepted Solid Precipitation and Determination of Evaporation from a Spruce Forest during a Winter Period (Otsenka velichiny zaderzhaniya tverdykh osadkov i opredeleniye ispareniya s yelovogo lesa v zimniy period),
W72-00065 2B

Accurate Measurement of Atmospheric Precipitation by the Tret'yakov Precipitation Gage (O korrektnom izmerenii atmosfernykh osadkov osadkomerom Tret'yakova),
W72-00066 2B

Forest Litter as an Accumulator of Moisture (Lesnaya podstilka--akkumulyator vlagi),
W72-00067 2G

Methods of Calculating Melt-water Percolation (Sposoby rascheta prosachivaniya talykh vod),
W72-00068 2G

Study of the Geometry of Sand Dunes and Estimation of Bottom Sediment Discharge (Issledovaniye geometricheskikh kharakteristik peschanykh gryad i otsenka raskhoda donnykh nanosov),
W72-00069 2J

Tentative Application of a Telethermometer for Measurement of Water-surface Temperature (Opyt primeneniya distantsionnoy ustanovki dlya izmereniya temperatury poverkhnosti vody),
W72-00070 2H

Studies of Subsurface Flow (Issledovaniya podzemnogo stoka),
W72-00319 2F

Analysis of the Interaction of River and Subsurface Waters (Nekotoryye elementy analiza vzaimodeystviya rechnykh i podzemnykh vod),
W72-00320 2F

Role of Artesian Water in the Formation of Streamflow as Illustrated by the Tosna River (Otsenka roli napornykh podzemnykh vod v formirovanii rechnogo stoka na primere r. Tosny),
W72-00321 2F

Accuracy of Field Hydrometric Work in Studying Subsurface Flow (Tochnost' ekspeditsionnykh gidrometricheskikh rabot pri izuchenii podzemnogo stoka),
W72-00322 2F

Study of Ice-Lens Formation Patterns (Issledovaniye zakonomernostey formirovaniya naledey),
W72-00323 2F

Estimation of Groundwater Recharge by Atmospheric Precipitation with Few or no Observations of the Groundwater Regime (Metod otsenki pitaniya gruntovykh vod atmosfernymi osadkami pri nedostatochnosti ili otsutstvii nablyudeniy za rezhimom gruntovykh vod),
W72-00324 2F

Effect of Intensive Groundwater use on Streamflow (Ob issledovanii vliyaniya intensivnoy ekspluatatsii podzemnykh vod na stok rek),
W72-00325 2F

Surface and Subsurface Flow into Rivers of the West Siberian Plain (Poverkhnostnyy i podzemnyy pritok v reki Zapadno-Sibirskoy ravniny),
W72-00326 2F

Thermodynamics and Composition of the Liquid Water Phase in Frozen Peat with Application to Infiltration Studies (K voprosu o faxovom sostave vody i teplofizicheskikh kharakteristikakh merzlogo torfa pri izuchenii infil' tratsii),

W72-00327 2F

Perennial Fluctuations of Minimum Streamflow in the European USSR During a Winter Period (Nekotoryye zakonomernosti mnogoletnikh kolebaniy minimal'nogo stoka rek ETS v zimniy period),
W72-00328 2F

GRAVER WATER CONDITIONING CO., UNION, N.J.
The Graver C.I. Process Continuous Countercurrent Filtration and Adsorption,
W72-00040 5D

GRIFFITH (L.B.), FALLS CHURCH, VA.
BOD From Poultry Processing Plants,
W72-00444 5D

GRUMMAN AEROSPACE CPRP., BETHPAGE, N.Y.
Development of Immobilized Enzyme Systems for Enhancement of Biological Waste Treatment Processes,
W72-00002 5D

GULF OIL CO., HOUSTON, TEX.
Federal Water Pollution Legislation and Regulations with Particular Reference to the Oil Industry,
W72-00255 5G

GURNHAM, BRAMER AND ASSOCIATES, INC., CHICAGO, ILL.
Projected Wastewater Treatment Costs in the Organic Chemicals Industry,
W72-00028 5D

HARVARD UNIV., CAMBRIDGE, MASS.
Varied Responses to India's Agricultural Strategy,
W72-00173 3F

HARZA ENGINEERING CO., CHICAGO, ILL.
Estimating Soil Permeability Rates,
W72-00345 2G

HEBREW UNIV., JERUSALEM (ISRAEL); AND VOLCANI INST. OF AGRICULTURAL RESEARCH, BET-DAGAN, (ISRAEL).
A Model for the Economic Evaluation of Water Quality in Irrigation,
W72-00382 3F

HOUSE OF REPRESENTATIVES, WASHINGTON, D. C.
How we Got the Dirtiest Stream in America,
W72-00282 5G

HYDROSCIENCE, INC., LEONIA, N.J.
A Critical Review of BOD Analysis Using Respirometer Techniques,
W72-00036 5A

HYPERION TREATMENT PLANT, LOS ANGELES, CALIF.
Operational and Maintenance Experience In Screening Digested Sludge,
W72-00044 5D

ILLINOIS SANITARY WATER BOARD, SPRINGFIELD.
Water Quality Standards (Interstate Waters, Illinois River and Lower Section of Des Plaines River),
W72-00195 6E

Water Quality Standards (Interstate Waters, Lake Michigan and Little Calumet River, Grand Calumet River and Wolf Lake).
W72-00196 5G

ILLINOIS STATE DEPT. OF HEALTH, SPRINGFIELD.
The Water Pollution Control Agency: Legas Basis, Administration Regulations And Staffing,
W72-00221 5G

INDIANA STATE UNIV., TERRE HAUTE. DEPT. OF LIFE SCIENCES.
The Use of Biological Analyses as Indicators of Water Quality,
W72-00154 5A

INTERNATIONAL HARVESTER CO., LOUISVILLE, KY. FARM EQUIPMENT DIV.
Operation of a Treatment Works Handling the Wastes from the Processing of Truck Bodies,
W72-00026 5D

IOWA STATE UNIV. OF SCIENCE AND TECHNOLOGY, AMES.
Treatment of Wastewaters by Pulsed Adsorption Beds,
W72-00425 5D

IOWA STATE UNIV., OF SCIENCE AND TECHNOLOGY, AMES. ENGINEERING RESEARCH INST.
Gas Absorption in a Heterogeneous System,
W72-00085 5A

IOWA WATER POLLUTION CONTROL COMMISSION, DES MOINES.
Rules and Regulations--Water Quality Standards.
W72-00194 5G

IRAQ INST. FOR APPLIED RESEARCH ON NATURAL RESOURCES, BAGHDAD.
Range Ecology at the Institute,
W72-00166 3F

JOHN HOPKINS UNIV., BALTIMORE, MD.
REMOVAL OF WHITE WATER EFFLUENT TURBIDITY BY BIOLOGICAL TREATMENT PROCESSES,
W72-00022 5D

JOHNS HOPKINS UNIV., BALTIMORE, MD. DEPT. OF ENVIRONMENTAL HEALTH ENGINEERING.
Inactivation of Virus in Sewage,
W72-00412 5D

JOHNS HOPKINS UNIV., BALTIMORE, MD. DEPT. OF GEOGRAPHY AND ENVIRONMENTAL ENGINEERING.
Experience in the Treatment and Re-use of Industrial Waste Waters,
W72-00027 5D

KANSAS STATE BOARD OF HEALTH, TOPEKA.
Water Quality Criteria for Specified River Basins.
W72-00449 5G

KENTUCKY UNIV., LEXINGTON.
Analog Analysis of Water Distribution Networks,
W72-00071 7A

Composition Studies of Activated Sludge,
W72-00443 5D

KENTUCKY UNIV., LEXINGTON. DEPT. OF CHEMICAL ENGINEERING.
Precipitate Flotation of Complexed Cyanide,
W72-00029 5D

KON-TIKI MUSEUM, OSLO (NORWAY); AND COLLA MICHERI, LAIGUEGLIA (ITALY).
Atlantic Ocean Pollution and Biota Observed by the 'RA' Expeditions,
W72-00147 5C

LOUISIANA STATE UNIV., BATON ROUGE. SCHOOL OF FORESTRY AND WILDLIFE MANAGEMENT.
Toxicity of Certain Chemicals to Juvenile Pompano,
W72-00143 5C

MAHIDOL UNIV., BANGKOK (THAILAND). FACULTY OF TROPICAL MEDICINE.
General Studies on Trematodes in Thailand: Classification of Cercariae in Thailand,
W72-00138 5C

MANITOBA UNIV., WINNIPEG.
Hvdc transmission Control Schemes.
W72-00342 8C

MARYLAND UNIV., COLLEGE PARK. WATER RESOURCES RESEARCH CENTER.
Adsorption of Sulfur Containing Taste and Odor Compounds on Activated Carbon,
W72-00423 5D

MASSACHUSETTS UNIV., AMHERST.
Management Model for Terrestrial Wildlife Based on Energy Relationships,
W72-00052 6G

The Fishery Potential of Four Aquatic Environments Created by Interstate Route 91 Construction in Massachusetts,
W72-00135 4C

A Comparative Assessment of Pollution's Effect on the Benthic Macroinvertebrates of the Millers River, Massachusetts Using Factor Analysis, Diversity, Indices and Cluster Analysis of Similarity Coefficients,
W72-00136 5C

Biological Investigation of Atlantic Tomcod, Microgadus Tomcod (Walbaum), in the Weweantic River Estuary, Massachusetts, 1967,
W72-00139 5C

MASSACHUSETTS UNIV., AMHERST, DEPT. OF FORESTRY AND WILDLIFE.
Utilization of Interstate Highway Construction to Create Productive Wetlands for Wildlife,
W72-00053 4C

MASSACHUSETTS UNIV., AMHERST. DEPT. OF GEOLOGY.
Shoreline Orientation and Storm Surge,
W72-00132 2J

MASSACHUSETTS UNIV., AMHERST. WATER RESOURCES RESEARCH CENTER.
A Methodology For Determining Optimum Longitudinal Spacing of Effluent Discharges Into A River,
W72-00047 5B

MASSUCHUSETTS UNIV., AMHERST. WATER RESOURCES RESEARCH CENTER.
Multi-time Period, Facilities Location Problems: A Heuristic Algorithm With Applications To Wastewater Treatment Systems,

W72-00048 5D

MCGILL UNIV., MONTREAL (QUEBEC). DEPT. OF GEOGRAPHY.
Soil Moisture,
W72-00104 2G

MCGILL UNIV., MONTREAL (QUEBEC). ICE RESEARCH PROJECT.
Albedo and Degree of Puddling of a Melting Cover of Sea Ice,
W72-00331 2C

MCMASTER UNIV., HAMILTON (ONTARIO).
Beach Processes and Shoreline Changes, Kouchibouguac Bay, New Brunswick,
W72-00133 2L

MCNAMEE, PORTER AND SEELEY, ANN ARBOR, MICH.
Direct Digtal Control at Grand Rapids, Michigan,
W72-00043 5D

METEOROLOGICAL OFFICE, POONA (INDIA).
On the Global Solar Radiation Climate and Evapotranspiration Estimates in India,
W72-00180 2D

MICHIGAN STATE UNIV., EAST LANSING. DEPT. OF CROP AND SOIL SCIENCES.
The Nutrient Content of Drainage Water from Agricultural Land,
W72-00157 5C

MICHIGAN TECHNOLOGICAL UNIV., HOUGHTON.
An Experimental Valuation of the Intra-particle Resistance in Substrate Transfer to Suspended Zoogloeal Particles,
W72-00433 5D

MICHIGAN UNIV., ANN ARBOR.
A Field Study of Inorganic Nitrogen Oxidation Rates,
W72-00018 5B

MICHIGAN WATER RESOURCES COMMISSION, LANSING. DEPT. OF NATURAL RESOURCES.
Interstate and Intrastate Water Temperature Standards for Protection of Fish and Aquatic Life.
W72-00198 5G

Summary of Water Quality Standards for Designated use Areas in Michigan Interstate Waters.
W72-00199 5G

How your Michigan Water Resources Commission Protects Michigan's Lakes and Streams.
W72-00200 6E

Michigan's Intrastate Water Quality Standards--Intrastate Use Designation Areas.
W72-00201 5G

MINISTRY OF FOREIGN AFFAIRS KARACHI (PAKISTAN).
Pakistan's Water Problems and the Law of International Rivers,
W72-00179 6E

MINNEAPOLIS-SAINT PAUL SANITARY DISTRICT, MINN.
Dispatching System for Control of Combined Sewer Losses,
W72-00080 5G

MINNESOTA UNIV., ST. PAUL. DEPT. OF ENTOMOLOGY, FISHERIES, AND WILDLIFE.
Survival and Hatching of Walleye Eggs at Various Dissolved Oxygen Levels,
W72-00142 5C

MINNESOTA UNIV., ST. PAUL. SCHOOL OF FORESTRY.
Osmotic Water Stress: Mesophyll Saturation Deficit and Transpiration Rates of Tamarisk,
W72-00172 2D

MISSISSIPPI STATE UNIV., STATE COLLEGE. DEPT. OF AGRONOMY.
Effect of Temperature on Pressure Head-water Content Relationship and Conductivity of Two Soils,
W72-00312 2G

MISSOURI UNIV., COLUMBIA.
Method of a New Differential Thermal Analysis,
W72-00030 5A

MISSOURI UNIV., ROLLA.
Treatment of Refinery Wastes by Physico Chemical Processes,
W72-00005 5D

Missouri Stream Studies Relating to the 'New Lead Belt',
W72-00089 5B

MIXING EQUIPMENT CO., INC., ROCHESTER, N.Y.
The Case for Deep Aeration Tanks,
W72-00015 5D

MOBILE OIL CORP., DALLAS, TEX.
Pollution Problems in the Petroleum Industry--Construction of and Compliance with Federal and State Laws,
W72-00455 5G

MONTGOMERY RESEARCH INC., PASADENA, CALIF.
SUBMARINE DISPOSAL OF INDUSTRIAL WASTE,
W72-00041 5E

MOSCOW STATE UNIV. (USSR); AND AKADEMIYA NAUK SSSR, MOSCOW. INST. OF WATER RESEARCH; AND AKADEMIYA NAUK SSSR, MOSCOW. GEOLOGICHESKII INSTITUT; AND GOSUDARSTVENNYI GIDROLOGICHESKII INSTITUT, MOSCOW (USSR).
The Freshwater-Supply Problems of Mankind,
W72-00187 2A

NATIONAL CANNERS ASSOCIATION, BERKELEY, CALIF. WESTERN RESEARCH LAB.
Reduction of Salt Content of Food Processing Liquid Waste Effluent,
W72-00409 5D

NATIONAL INST. FOR WATER RESEARCH, CONGELLA (SOUTH AFRICA) REGIONAL LAB.
Chemistry of Natural waters - III Carbonic Acid,
W72-00127 5A

NATIONAL INST. OF OCEANOGRAPHY, WORMELY (ENGLAND).
Precise Sediment Density Determination by Gamma-Ray Attenuation Alone,
W72-00059 2J

NATIONAL MARINE FISHERIES SERVICE, AUKE BAY, ALASKA. BIOLOGICAL LAB.
Residues in Fish, Wildlife, and Estuaries,
W72-00122 5B

NATIONAL SANITATION FOUNDATION, ANN ARBOR, MICH.
The Effect of Surface Active Agents on Substrate Utilization in an Experimental Activated Sludge System,
W72-00035 5D

NATIONAL WATERWAYS CONFERENCE.
Nourishing Public Participation,
W72-00394 6B

NATURE CONSERVANCY, ABBOTS RIPTON (ENGLAND). MONKS WOOD EXPERIMENTAL STATION; AND IMPERIAL CHEMICAL INDUSTRIES LTD., JEALOTT'S HILL (ENGLAND). JEALOTT'S HILL RESEARCH STATION; AND NOTTINGHAM UNIV. (ENGLAND). DEPT. OF BOTANY.
Some Ecological Effects on the Use of Paraquat for the Control of Weeds in Small Lakes,
W72-00155 4A

NAVAL UNDERWATER SYSTEMS CENTER, NEWPORT, R.I. OCEAN SCIENCE DEPT.
Improved Discrete Depth Sampler,
W72-00093 7B

NAVAL WAR COLLEGE, NEWPORT, R. I.
Amenities Rights--Parallels to Pollution Taxes,
W72-00192 5G

NEBRASKA UNIV., LINCOLN. DEPT. OF AGRICULTURAL ENGINEERING.
An Automatic Runoff Sampler,
W72-00118 7B

NEVADA STATE DIV. OF WATER RESOURCES, CARSON CITY.
Water Supply for the Future in Southern Nevada.
W72-00181 6D

NEW MEXICO STATE UNIV., UNIVERSITY PARK.
An Experimental Study of the Effect of Channel Surface Roughness on the Reaeration Rate Coefficient,
W72-00039 5G

Hydrolysis of Lipids in Wastewater,
W72-00421 5D

NEW YORK STATE DEPT. OF ENVIRONMENTAL CONSERVATION, ALBANY.
New York's Water Quality Surveillance Program,
W72-00424 5G

NEW YORK STATE DEPT. OF ENVIRONMENTAL CONSERVATION, ALBANY. DIV. OF PURE WATERS.
Implications of Nitrogenous BOD in Treatment Plant Design,
W72-00420 5D

NEW YORK STATE DEPT. OF HEALTH, ALBANY.
Impact of Stream Assimilation Capacity on Waste Treatment Requirements,

W72-00432 5C

NEW YORK UNIV., N.Y. SCHOOL OF LAW.
The 1969 Brussels Convention On Civil Liability For Oil Pollution,
W72-00238 5G

NIPPON KOKAN K. K., FUKUYAMA.
Horizontal HCl Pickling Line at Fukuyama,
W72-00004 5D

NORTH AMERICAN ROCKWELL CORP., CANOGA PARK, CALIF. ROCKETDYNE RESEARCH.
Development of a Chemical Denitrification Process,
W72-00001 5D

NORTH AMERICAN WEATHER CONSULTANTS, GOLETA, CALIF.
Performance of an Atmospheric Water Resources Research Program in the Hungry Horse Area, Montana, 1969-70 Season.
W72-00375 3B

NORTHEASTERN UNIV., BOSTON, MASS.
Streamflow Routing for Water Pollution Studies,
W72-00124 5G

NORTHWEST PULP AND PAPER ASSOCATION, SEATTLE, WASH.
Pulp-mill Waste-water Discharges into Puget Sound: An Industry Viewpoint,
W72-00258 5G

NOTRE DAME, UNIV., IND.
Chemical Conditioning of Biological Sludges for Vacuum Filtration,
W72-00037 5D

Disinfection of Algal Laden Waters,
W72-00411 5D

NUS CORP., PITTSBURGH, PA. CYRUS WM. RICE DIV.
The Effects of Various Atmospheres on the Oxidation of Coal Mine Pyrites,
W72-00081 5G

OFFICE OF THE GOVERNOR, AUGUSTA, MA.
Maine's Oil Spill Legislation: Can a State with an Extensive Interest in its Coastal Resources Protect Itself from Inadequacies in National and International Law,
W72-00283 5G

OHIO STATE UNIV., COLUMBUS. INST. OF POLAR STUDIES.
Elexure of a Floating Ice Tongue,
W72-00330 2C

Observations on a Collapsing Kame Terrace in Glacier Bay National Monument, South-Eastern Alaska,
W72-00332 2C

OKLAHOMA UNIV., NORMAN. BUREAU OF WATER RESOURCES RESEARCH.
Evaluation of Dispersed Pollutional Loads from Urban Areas,
W72-00355 5B

OREGON STATE UNIV., CORVALLIS.
Attitudes, Assessments, and Action,
W72-00013 5G

Pollutants Leached from Selected Species of Wood in Log Storage Waters,
W72-00019 5B

OREGON STATE UNIV., CORVALLIS. DEPT. OF CIVIL ENGINEERING.
Subtle Aspects of Ecosystem Management,
W72-00430 6G

OREGON STATE UNIV., CORVALLIS. DEPT. OF FOOD SCIENCE AND TECHNOLOGY.
Analysis of Food Processing Wastewaters,
W72-00011 5D

OREGON STATE UNIV., CORVALLIS. DEPT. OF FOREST ENGINEERING.
The Forest Environment--Problems and Promises,
W72-00010 6D

Development of a Stability Correction for Estimating Convective Transfer,
W72-00316 2B

OTTAWA UNIV. (ONTARIO).
Oil Pollution Control in the Canadian Arctic,
W72-00254 5G

PACIFIC NORTHWEST WATER LAB., CORVALLIS, OREG.
A Procedure for Tracing of Kraft Mill Effluent from an Ocean Outfall by Constituent Fluorescence,
W72-00123 5B

Ocean Outfall Design: Part I - Literature Review and Theoretical Development,
W72-00356 5B

PENNSYLVANIA STATE UNIV., UNIVERSITY PARK.
An Automated Test Facility for Rock Mechanics Research,
W72-00344 8E

PENNWALT CORP., WARMINSTER, PA.
Centrifuges in Water and Waste Treatment,
W72-00016 5D

PURDUE UNIV., LAFAYETTE, IND. DEPT. OF AGRICULTURAL ENGINEERING.
Effect of Rainfall on the Resistance in Channels with Shallow Flow,
W72-00307 8B

PURDUE UNIV., LAFAYETTE, IND. SCHOOL OF CIVIL ENGINEERING.
Stochastic Difference Equation Modelling of Hydrologic Processes,
W72-00306 2A

Characteristics and Filtering of Noise in Linear Hydrologic Systems,
W72-00310 2A

Linear Systems Analysis in Hydrology--The Transform approach, the Kernel Oscillations and the Effect of Noise,
W72-00317 2A

QUIRK, LAWLER AND MATUSKY, NEW YORK.
Kinetic Aanalysis of Data from Biological Systems,
W72-00007 5D

RESOURCES FOR THE FUTURE, INC., WASHINGTON, D.C.
International Environmental Problems--A Taxonomy,
W72-00384 5C

RHODE ISLAND STATE DEPT., OF HEALTH, PROVIDENCE.
Rules and Regulations Establishing Minimum Standards Relating to Location, Design, Construction, and Maintenance of Individual Sewage Disposal Systems.
W72-00197 5E

RICE UNIV., HOUSTON, TEX.
Use and Abuse of Natural Water Systems,
W72-00380 5D

Kinetic and Stoichiometric Limitations of Phosphate in Pure and Mixed Bacterial Cultures,
W72-00440 5C

RICHMOND UNIV., VA. DEPT. OF BIOLOGY.
Effects of Zooplankton on Algae in Westhampton Lake,
W72-00150 5C

ROBERT A. TAFT WATER RESEARCH CENTER, CINCINNATI, OHIO. ADVANCED WASTE TREATMENT RESEARCH LAB.
A Mathematical Model for a Trickling Filter,
W72-00442 5D

ROBERT S. KERR WATER RESEARCH CENTER, ADA, OKLA.
Phosphate Removal by Activated Sludge,
W72-00008 5D

ROCKY MOUNTAIN FOREST AND RANGE EXPERIMENT STATION, TEMPE, ARIZ.
Suppression of Channel-Side Chaparral Cover Increases Streamflow,
W72-00054 4A

RUHRVERBAND, ESSEN (WEST GERMANY DEVELOPMENT DIVISION).
Treatment of Wastes from Meat Flour Factories,
W72-00437 5D

SENATE, WASHINGTON, D.C.
Introduction of a Bill to Amend the Clean Air Act and the Federal Water Pollution Control Act,
W72-00241 6E

SOIL CONSERVATION SERVICE, RALEIGH, N.C.
Stability of Coastal Plain Surfaces,
W72-00091 2J

SOIL CONSERVATION SERVICE, WASHINGTON, D.C.
Notes on Sedimentation Activities, Calender Year 1970.
W72-00318 2J

SOUTH FLORIDA UNIV., TAMPA. DEPT. OF CHEMISTRY.
Effect of Humic Acids on Iron Analyses in Natural Waters,
W72-00315 2K

SOUTHEASTERN MASSACHUSETTS TECHNOLOGICAL INST. NORTH DARTMOUTH.
Some Aspects of the Hydrography of a Relatively Unpolluted Estuary in Southeastern Massachusetts,
W72-00431 5C

SPALDING, DEDECKER AND SSOCIATES, INC, MADISON HEIGHTS, MICH.
Combined Wastewater Collection And Treatment Facility, Mount Clemens, Michigan,

W72-00042 5D

ST. REGIS PAPER CO., WEST NYACK, N.Y.
Determination of Sodium in Black Liquor Using a Selective Ion Electrode,
W72-00416 5D

STANFORD UNIV., CALIF.
Optimum Sample Sizes for Concrete Cylinder Tests Using Information Theory,
W72-00076 8F

STANFORD UNIV., PALO ALTO, CALIF. SCHOOL OF LAW.
The Use of the Corps of Engineers Permit Authority as a Tool for Defending the Environment,
W72-00253 5G

STANLEY CONSULTANTS, INC., MUSCATINE, IOWA.
Pigskin Tannery Waste,
W72-00024 5D

STATE PUBLIC HEALTH INSPECTORATE (USSR).
Water Pollution Control In The USSR And Eastern European Countries,
W72-00222 5G

STATE UNIV. OF NEW YORK, BINGHAMTON. RESEARCH FOUNDATION.
Evaluation of Natural River Environments: Phase II,
W72-00357 6B

SYDNEY UNIV. (AUSTRALIA). DEPT. OF GEOGRAPHY.
Hydraulic Geometry,
W72-00109 8B

Relation Of Morphometry To Runoff Frequency,
W72-00112 2E

SYRACUSE UNIV., N.Y.
DESIGN OF A TREATMENT PLANT FOR BAKERY WASTES,
W72-00021 5D

Rehabilitation of Solid Industrial Wastes Disposal Sites,
W72-00031 5E

TECHION - ISRAEL INST. OF TECH., HAIFA (ISRAEL). SANITARY ENGINEERING LAB.
Chlorination Dynamics in Wastewater Effluents,
W72-00422 5D

TENNESSEE STATE DEPT. OF PUBLIC HEALTH, NASHVILLE.
Anaerobic Lagoons Versus Aerated Lagoons in the Treatment of Packing-House Wastes,
W72-00441 5D

TENNESSEE STREAM POLLUTION CONTROL BOARD, NASHVILLE.
General Water Quality Criteria For The Definition And Control Of Pollution In The Waters Of Tennessee.
W72-00226 5G

TEXAS A AND M UNIV., COLLEGE STATION. COASTAL AND OCEAN ENGINEERING DIV.
A Method of Tracing Sediment Movement on the Texas Gulf Coast,
W72-00314 2J

TEXAS TECH UNIV., LUBBOCK. DEPT. OF GEOSCIENCE.
Infiltration Rates and Groundwater Quality Beneath Cattle Feedlots, Texas High Plains,
W72-00083 5B

TEXAS UNIV., AUSTIN. SCHOOL OF LAW.
Tort Liability and the Oil and Gas Industry,
W72-00257 5G

TRINITY COLL., DUBLIN (IRELAND). DEPT. OF GEOGRAPHY.
The Geomorphic Effects of Groundwater,
W72-00107 2F

UDAIPUR UNIV. (INDIA). DEPT. OF BOTANY.
Toxicity of Selenium to the Blue-Green Algae, Anacystis Nidulans and Anabaena Variabilis,
W72-00153 5C

UNIVERSITY OF SOUTHERN CALIFORNIA, LOS ANGELES. DEPT. OF GELOGICAL SCIENCES.
Some Simple Devices for the Study of Wave Induced Surges,
W72-00056 2E

UNIVERSITY OF SOUTHERN CALIFORNIA, LOS ANGELES. DEPT. OF PETROLEUM ENGINEERING.
Design and Operation of a Triaxial, High-Temperature, High-Pressure Compaction Apparatus,
W72-00058 2J

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG (SOUTH AFRICA). HYDROLOGICAL RESEARCH UNIT.
Appraisal and Management of Water Resources in South Africa,
W72-00186 6B

US PUBLIC HEALTH SERV.
Tritium in Surface Water Network January-June 1970.
W72-00521 5B

Radioactivity in Airborne Particulates and Precipitation.
W72-00522 5B

USCOLD COMMITTEE ON MODEL LEGISLATION FOR STATE SAFETY OF DAMS, NEW YORK.
Model Law to Improve Dam Safety,
W72-00073 6E

UTAH STATE UNIV., LOGAN.
The Money Gap - Can States Fill It,
W72-00396 6C

UTAH STATE UNIV., LOGAN. UTAH WATER RESEARCH LAB.
Computer Simulation of the Hydrologic-Salinity Flow System within the Upper Colorado River Basin,
W72-00084 7C

VIRGINIA MILITARY INST., LEXINGTON.
The Hydraulic Performance of Chlorine Contact Tanks,
W72-00448 5D

VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG.
Influence of Several Species of Aquatic Plants on Dichlobenil Residues in Water,
W72-00137 5C

Effects of Reservoir Operating Policy on Recreation Benefits,
W72-00399 4A

VOLCANI INST. OF AGRICULTURAL RESEARCH, ILANOT (ISRAEL). FORESTRY DIV.
The Effect of Air Temperature and Moisture Stress Upon Leaf Surface Temperatures of Calotropis Procera (Willd.) R. Br.,
W72-00183 2I

WASHINGTON STATE DEPARTMENT OF ECOLOGY, OLYMPIA.
Implementation and Enforcement Plan for Water Quality Regulations.
W72-00453 5G

WASHINGTON STATE DEPT. OF ECOLOGY, OLYMPIA.
Rules and Regulations for the Development, Submission and Adoption of Water Pollution Control and Abatement Plans for Sewage Drainage Basins.
W72-00284 5G

WASHINGTON STATE UNIV., PULLMAN. WATER RESEARCH CENTER.
Investigation of Techniques to Provide Advance Warning of Ground-water Pollution Hazards with Special Reference to Aquifers in Glacial Outwash,
W72-00358 5B

WASHINGTON STATE WATER POLLUTION CONTROL COMMISSION, OLYMPIA.
Preliminary Investigation of the Low Dissolved Oxygen Concentrations that Exist in Long Lake Located Near Spokane, Washington,
W72-00156 5C

WASHINGTON UNIV., ST. LOUIS, MO.
Environmental Control of Growth and Differentiation in Multicellular Photosynthetics,
W72-00377 5B

WATER ECONOMICS RESEARCH INST., WROCLAW (POLAND). WATER PROTECTION RESEARCH SECTION.
Interpretation of Results from the Studies of Pollution of Surface Flowing Waters,
W72-00125 5A

WATER POLLUTION RESEARCH LAB., STEVENAGE (ENGLAND).
The Chemical States of Copper in Polluted Fresh Water and a Scheme of Analysis to Differentiate Them,
W72-00126 5B

WEST VIRGINIA UNIV., MORGANTOWN. DEPT. OF ECONOMICS; AND XAVIER UNIV., CINCINNATI, OHIO. DEPT. OF ECONOMICS AND FINANCE.
Costs and Effects of a Water Quality Program for a Small Strip Mining Company,
W72-00388 5G

WESTERN AUSTRALIA UNIV., NEDLANDS. DEPT. OF BOTANY.
Eco-Physiological Studies on Plants in Arid and Semi-Arid Regions in Western Australia. III. Comparative Studies of Photosynthesis, Respiration and Water Relations of Ten Arid Zone Plants Under Winter and Late Summer Climatic Conditions,
W72-00176 2I

WESTON (ROY F.), INC., WEST CHESTER, PA.
Combined Sewer Overflow Abatement Alternatives: Washington, D.C.,

W72-00082 5D

WHITE FISH AUTHORITY, WEST KILBRIDE (SCOTLAND). MARINE FISH CULTIVATION UNIT.
The Automatic Detection of Low Levels of Dissolved Free Chlorine in Fish Farming Experiments Using Seawater Effluents,
W72-00141 5C

WILLIAMS AND WORKS, GRAND RAPIDS, MICH.
Anaerobic Digestion of Sludges Containing Iron Phosphates,
W72-00414 5D

WISCONSIN STATE UNIV., OSHKOSH. DEPT. OF BIOLOGY.
Microfungi in the Water, Mud, and Litter of a Cattail Marsh,
W72-00151 5C

WISCONSIN UNIV., MILWAUKEE. CENTER FOR GREAT LAKES STUDIES.
The Great Lakes Container Dilemma,
W72-00385 6C

WUERZBURG UNIV. (WEST GERMANY). GEOGRAPHISCHES INSTITUT.
The Geomorphology of Central Australia, (Geomorphologie von Zentralaustralien Nach H. Bremer),
W72-00170 2J

ZIMPRO INC., ROTHSCHILD, WIS.
Zimpro Wet Oxidation of Soda Pulping Liquors,
W72-00032 5D

ACCESSION NUMBER INDEX

W72-00001 5D
W72-00002 5D
W72-00003 5D
W72-00004 5D
W72-00005 5D
W72-00006 6E
W72-00007 5D
W72-00008 5D
W72-00009 5A
W72-00010 6D
W72-00011 5D
W72-00012 5D
W72-00013 5G
W72-00014 5D
W72-00015 5D
W72-00016 5D
W72-00017 5D
W72-00018 5B
W72-00019 5B
W72-00020 5D
W72-00021 5D
W72-00022 5D
W72-00023 5D
W72-00024 5D
W72-00025 5D
W72-00026 5D
W72-00027 5D
W72-00028 5D
W72-00029 5D
W72-00030 5A
W72-00031 5E
W72-00032 5G
W72-00033 5D
W72-00034 5D
W72-00035 5D
W72-00036 5A
W72-00037 5D
W72-00038 5B
W72-00039 5G
W72-00040 5D
W72-00041 5E
W72-00042 5D
W72-00043 5D
W72-00044 5D
W72-00045 5D
W72-00046 5D
W72-00047 5B
W72-00048 5D
W72-00049 5D
W72-00050 5D
W72-00051 7B
W72-00052 6G
W72-00053 4C
W72-00054 4A
W72-00055 4A
W72-00056 2E
W72-00057 2J
W72-00058 2J
W72-00059 2J
W72-00060 7C
W72-00061 2B
W72-00062 2D
W72-00063 5B
W72-00064 5B
W72-00065 2B
W72-00066 2B
W72-00067 2G
W72-00068 2G
W72-00069 2J
W72-00070 2H
W72-00071 7A
W72-00072 7C
W72-00073 6E
W72-00074 8B
W72-00075 6E
W72-00076 8F
W72-00077 2F
W72-00078 8B
W72-00079 8E
W72-00080 5G
W72-00081 5G
W72-00082 5D
W72-00083 5B
W72-00084 7C
W72-00085 5A
W72-00086 2K
W72-00087 2C
W72-00088 2C
W72-00089 5B
W72-00090 2G
W72-00091 2J
W72-00092 2J
W72-00093 7B
W72-00094 2C
W72-00095 6E
W72-00096 2F
W72-00097 7C
W72-00098 7C
W72-00099 7C
W72-00100 2J
W72-00101 2J
W72-00102 2J
W72-00103 2J
W72-00104 2G
W72-00105 2G
W72-00106 2J
W72-00107 2F
W72-00108 8B
W72-00109 8B
W72-00110 2C
W72-00111 2C
W72-00112 2E
W72-00113 2E
W72-00114 2E
W72-00115 2E
W72-00116 8A
W72-00117 2E
W72-00118 7B
W72-00119 2E
W72-00120 5G
W72-00121 6E
W72-00122 5B
W72-00123 5B
W72-00124 5G
W72-00125 5A
W72-00126 5B
W72-00127 5A
W72-00128 5B
W72-00129 5C
W72-00130 2J
W72-00131 2L
W72-00132 2J
W72-00133 2L
W72-00134 2L
W72-00135 4C
W72-00136 5C
W72-00137 5C
W72-00138 5C
W72-00139 5C
W72-00140 6E
W72-00141 5C
W72-00142 5C
W72-00143 5C
W72-00144 5C
W72-00145 5C
W72-00146 6E
W72-00147 5C
W72-00148 5C
W72-00149 5C
W72-00150 5C
W72-00151 5C
W72-00152 5C
W72-00153 5C
W72-00154 5A
W72-00155 4A
W72-00156 5C
W72-00157 5C
W72-00158 5C
W72-00159 6E
W72-00160 6E
W72-00161 5C
W72-00162 5C
W72-00163 4A
W72-00164 4A
W72-00165 5C
W72-00166 3F
W72-00167 6E
W72-00168 2B
W72-00169 2D
W72-00170 2J
W72-00171 5C
W72-00172 2D
W72-00173 3F
W72-00174 5G
W72-00175 2D
W72-00176 2I
W72-00177 2J
W72-00178 2I
W72-00179 6E
W72-00180 2D
W72-00181 6D
W72-00182 2I
W72-00183 2I
W72-00184 2I
W72-00185 3F
W72-00186 6B
W72-00187 2A
W72-00188 5G
W72-00189 5G
W72-00190 2E
W72-00191 5G
W72-00192 5G
W72-00193 5B
W72-00194 5G
W72-00195 6E
W72-00196 5G
W72-00197 5E
W72-00198 5G
W72-00199 5G
W72-00200 6E
W72-00201 5G
W72-00202 6E
W72-00203 6E
W72-00204 6E
W72-00205 6E
W72-00206 5D
W72-00207 1B
W72-00208 5D
W72-00209 5D
W72-00210 5D
W72-00211 5D
W72-00212 5D
W72-00213 6E
W72-00214 6E
W72-00215 5G
W72-00216 6E
W72-00217 6E
W72-00218 5G
W72-00219 5G
W72-00220 6E
W72-00221 5G
W72-00222 5G
W72-00223 5G
W72-00224 5G
W72-00225 5G
W72-00226 5G
W72-00227 6E
W72-00228 6E
W72-00229 6E
W72-00230 6E
W72-00231 5G
W72-00232 5G
W72-00233 5G
W72-00234 5G
W72-00235 5G
W72-00236 5G
W72-00237 5G
W72-00238 5G
W72-00239 5G
W72-00240 5G
W72-00241 6E
W72-00242 6E
W72-00243 5D
W72-00244 6E
W72-00245 6E
W72-00246 5G
W72-00247 5G
W72-00248 6E
W72-00249 6E
W72-00250 6E
W72-00251 6E
W72-00252 6E
W72-00253 5G
W72-00254 5G
W72-00255 5G
W72-00256 5G
W72-00257 5G
W72-00258 5G
W72-00259 5G
W72-00260 5G
W72-00261 6E
W72-00262 6E
W72-00263 6E
W72-00264 6E
W72-00265 6E
W72-00266 6E
W72-00267 6E
W72-00268 6E
W72-00269 5G
W72-00270 5G
W72-00271 6E
W72-00272 5G
W72-00273 6E
W72-00274 6E
W72-00275 6E
W72-00276 6E
W72-00277 6E
W72-00278 6E
W72-00279 5G
W72-00280 5G
W72-00281 5G
W72-00282 5G
W72-00283 5G
W72-00284 5G
W72-00285 6E
W72-00286 5G
W72-00287 5G
W72-00288 5G
W72-00289 5G
W72-00290 6E
W72-00291 6E
W72-00292 6E
W72-00293 6E
W72-00294 6E
W72-00295 6E
W72-00296 6E
W72-00297 6E
W72-00298 6E
W72-00299 5G
W72-00300 5G
W72-00301 6E
W72-00302 6E
W72-00303 6E
W72-00304 6E
W72-00305 5A
W72-00306 2A
W72-00307 8B
W72-00308 2G
W72-00309 2G
W72-00310 2A
W72-00311 2G
W72-00312 2G

W72-00313 2G
W72-00314 2J
W72-00315 2K
W72-00316 2B
W72-00317 2A
W72-00318 2J
W72-00319 2F
W72-00320 2F
W72-00321 2F
W72-00322 2F
W72-00323 2F
W72-00324 2F
W72-00325 2F
W72-00326 2F
W72-00327 2F
W72-00328 2F
W72-00329 2C
W72-00330 2C
W72-00331 2C
W72-00332 2C
W72-00333 6E
W72-00334 2C
W72-00335 6E
W72-00336 2C
W72-00337 8D
W72-00338 8C
W72-00339 8C
W72-00340 6D
W72-00341 8B
W72-00342 8C
W72-00343 6E
W72-00344 8E
W72-00345 2G
W72-00346 8B
W72-00347 8B
W72-00348 6G
W72-00349 6B
W72-00350 7B
W72-00351 8B
W72-00352 7B
W72-00353 6E
W72-00354 5C
W72-00355 5B
W72-00356 5B
W72-00357 6B
W72-00358 5B
W72-00359 8B
W72-00360 8B
W72-00361 5F
W72-00362 8B
W72-00363 5G
W72-00364 8B
W72-00365 8B
W72-00366 8B
W72-00367 8B
W72-00368 8B
W72-00369 8B
W72-00370 8B
W72-00371 8B
W72-00372 8B
W72-00373 8B
W72-00374 5B
W72-00375 3B
W72-00376 8D
W72-00377 5B
W72-00378 1A
W72-00379 3A
W72-00380 5D
W72-00381 6E
W72-00382 3F
W72-00383 5D
W72-00384 5C
W72-00385 6C
W72-00386 6C
W72-00387 6E
W72-00388 5G
W72-00389 6E
W72-00390 6B
W72-00391 6B
W72-00392 6B
W72-00393 2L
W72-00394 6B
W72-00395 6B
W72-00396 6C
W72-00397 6E
W72-00398 6E
W72-00399 4A
W72-00400 6E
W72-00401 6E
W72-00402 6D
W72-00403 6B
W72-00404 5G
W72-00405 5G
W72-00406 6B
W72-00407 6B
W72-00408 5D
W72-00409 5D
W72-00410 5D
W72-00411 5D
W72-00412 5D
W72-00413 6E
W72-00414 5D
W72-00415 5D
W72-00416 5D
W72-00417 5D
W72-00418 6E
W72-00419 5D
W72-00420 5D
W72-00421 5D
W72-00422 5D
W72-00423 5D
W72-00424 5G
W72-00425 5D
W72-00426 5G
W72-00427 5G
W72-00428 5G
W72-00429 6B
W72-00430 6G
W72-00431 5C
W72-00432 5C
W72-00433 5D
W72-00434 5D
W72-00435 5D
W72-00436 5D
W72-00437 5D
W72-00438 6E
W72-00439 5D
W72-00440 5C
W72-00441 5D
W72-00442 5D
W72-00443 5D
W72-00444 5D
W72-00445 5D
W72-00446 5D
W72-00447 5D
W72-00448 5D
W72-00449 5G
W72-00450 5G
W72-00451 5G
W72-00452 6E
W72-00453 5G
W72-00454 5G
W72-00455 5G
W72-00456 6E
W72-00457 5G
W72-00458 6E
W72-00459 5G
W72-00460 6E
W72-00461 6E
W72-00462 5G
W72-00463 6E
W72-00464 5G
W72-00465 6E
W72-00466 6E
W72-00467 5G
W72-00468 6E
W72-00469 6E
W72-00470 6E
W72-00471 6E
W72-00472 6E
W72-00473 6E
W72-00474 6E
W72-00475 6E
W72-00476 6E
W72-00477 6E
W72-00478 6E
W72-00479 6E
W72-00480 6E
W72-00481 6E
W72-00482 6E
W72-00483 6E
W72-00484 6E
W72-00485 6E
W72-00486 6E
W72-00487 6E
W72-00488 6E
W72-00489 6E
W72-00490 6E
W72-00491 6E
W72-00492 6E
W72-00493 6E
W72-00494 6E
W72-00495 6E
W72-00496 6E
W72-00497 6E
W72-00498 6E
W72-00499 6E
W72-00500 6E
W72-00501 6E
W72-00502 6E
W72-00503 6E
W72-00504 6E
W72-00505 6E
W72-00506 6E
W72-00507 6E
W72-00508 6E
W72-00509 6E
W72-00510 6E
W72-00511 6E
W72-00512 6E
W72-00513 6E
W72-00514 6E
W72-00515 6E
W72-00516 6E
W72-00517 6E
W72-00518 6E
W72-00519 6E
W72-00520 6E
W72-00521 5B
W72-00522 5B
W72-00523 2I
W72-00524 2H
W72-00525 7B
W72-00526 2I
W72-00527 5A
W72-00528 5C
W72-00529 2I
W72-00530 5C
W72-00531
W72-00532 2H
W72-00533 8I
W72-00534 5C
W72-00535 5G
W72-00536 5C
W72-00537 3F
W72-00538 5G
W72-00539 2I
W72-00540 2I
W72-00541 2I
W72-00542 3F
W72-00543 6E
W72-00544 6E
W72-00545 3F
W72-00546 2G
W72-00547 2G
W72-00548 5C
W72-00549 3F
W72-00550 3F
W72-00551 3F
W72-00552 3F
W72-00553 3F
W72-00554 3F
W72-00555 5C
W72-00556 5C
W72-00557 2I
W72-00558 5C
W72-00559 2I
W72-00560 2I
W72-00561 2I
W72-00562 2I
W72-00563 5C
W72-00564 2I
W72-00565 2I
W72-00566 5C
W72-00567 5C
W72-00568 2I
W72-00569 5C
W72-00570 2I

ABSTRACT SOURCES

Source	Accession Number	Total
A. Center of Competence		
University of Texas, Wastewater Treatment and Management	W72-00001--00005 00007--00050 00408--00412 00414--00417 00419--00437 00439--00448	87
U. S. Geological Survey, Hydrology	W72-00051--00070 00085--00094 00096--00120 00122--00134 00305--00332 00334, 00336	100
University of Arizona, Arid Land Water Resources	W72-00168--00187 00207, 00166	22
Bureau of Reclamation, Engineering Works	W72-00071--00079 00337--00342 00344--00345	17
University of Washington, Water Quality Requirements for Aquatic Organisms	W72-00135--00139 00141--00145 00147--00149	13
University of Wisconsin, Eutrophication	W72-00150--00158 00161--00165	14
University of Chicago, Metropolitan Water Resources Management	W72-00390--00396 00402--00407 00399	14
University of Wisconsin, Water Resources Economics	W72-00382--00386 00380, 00388	7
University of Florida, Eastern U. S. Water Law	W72-00188--00206 00208--00213 00215--00304 00449--00457 00467--00520 00459, 00462 00464, 00006 00095, 00121 00140, 00146 00159, 00160 00167, 00214 00207, 00333 00335, 00343 00353, 00363 00381, 00387 00389, 00397 00398, 00400 00401, 00413 00418, 00438 00458, 00460 00461, 00463 00465, 00466 00543, 00544	213

ABSTRACT SOURCES

Source	Accession Number	Total
B. State Water Resources Research Institutes		
Washington Water Research Center	W72-00358	1
C. Other		
Biosciences Information Service	W72-00521--00542 00545--00570	48
Environmental Protection Agency	W72-00080--00084 00354--00356	8
Corps of Engineers	W72-00346--00352 00359--00362 00364--00373	21
Office of Saline Water	W72-00378	1
Office of Water Resources Research	W72-00374, 00357	2

☆ U. S. GOVERNMENT PRINTING OFFICE : 1972 O - LT - 481-635 (11)

CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- **Ground and surface water hydrology at the Water Resources Division of the U. S. Geological Survey, U. S. Department of the Interior.**
- **Metropolitan water resources management at the Center for Urban Studies of the University of Chicago.**
- **Eastern United States water law at the College of Law of the University of Florida.**
- **Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.**
- **Water resources economics at the Water Resources Center of the University of Wisconsin.**
- Design and construction of hydraulic structures; weather modification; and evaporation control at the Bureau of Reclamation, Denver, Colorado.
- Eutrophication at the Water Resources Center of the University of Wisconsin, jointly sponsored by the Soap and Detergent Association and the Agricultural Research Service.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Public Work Supply Treatment Technology at the American Water Works Association.

Supported by the Environmental Protection Agency in cooperation with WRSIC.

- Thermal pollution at the Department of Sanitary and Water Resources Engineering of Vanderbilt University.
- Water quality requirements for freshwater and marine organisms at the College of Fisheries of the University of Washington.
- Wastewater treatment and management at the Center for Research in Water Resources of the University of Texas.
- Agricultural livestock wastes at the Department of Agricultural Engineering of Iowa State University.
- Methods for chemical and biological identification and measurement of pollutants at the Analytical Quality Control Laboratory of the Environmental Protection Agency.
- Coastal pollution at the Oceanic Research Institute.
- Water treatment plant waste pollution control at American Water Works Association Research Foundation.

Subject Fields

1 NATURE OF WATER

2 WATER CYCLE

3 WATER SUPPLY AUGMENTATION AND CONSERVATION

4 WATER QUANTITY MANAGEMENT AND CONTROL

5 WATER QUALITY MANAGEMENT AND PROTECTION

6 WATER RESOURCES PLANNING

7 RESOURCES DATA

8 ENGINEERING WORKS

9 MANPOWER, GRANTS, AND FACILITIES

10 SCIENTIFIC AND TECHNICAL INFORMATION

INDEXES

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

ABSTRACT SOURCES

U.S. MAIL

POSTAGE AND FEES PAID
U.S. DEPARTMENT OF COMMERCE

LIBRARY
FEB 1 1972
PACIFIC POWER & LIGHT COMPANY

U.S. DEPARTMENT OF COMMERCE
National Technical Information Service
Springfield, Va. 22151

OFFICIAL BUSINESS

PRINTED MATTER